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A JOURNEY UP THE YUKON RIVER.

BY

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The Yukon river has its source in the mountains near the coast in the northwestern portion of Canada and flows in a curving course, first northwest and then southwest, through Alaska and empties into Bering Sea. Its length, including its many windings, is from 2,000 to 2,500 miles; and the area it drains in the neighborhood of 440,000 square miles. Next to the basin of the Mackenzie, the region drained by Alaska's great river is the least known of any of the larger river valleys of North America.

In the summer season of 1889, I accompanied an expedition sent out by the U. S. Coast and Geodetic Survey for the purpose of marking the localities where the Alaska-Canadian boundary crosses the Yukon and Porcupine rivers, respectively. My connection with the expedition was that of a geological *attaché*, as I was sent by the Director of the U. S. Geological Survey, for the purpose of making such observations on the character and resources of the country as the nature of the journey would allow. The expedition consisted of two independent parties in charge of Mr. J. E. McGrath, and Mr. J. H. Turner.

Preparations for a two years' sojourn in the Arctic were made in San Francisco, and on June 14 we sailed for Unalaska, on the steamer *Bertha*. After a brief stay at Unalaska, during which our equipage was transferred to the steamer *St. Paul*, we crossed Bering Sea, and on July 7 anchored in shallow water about a mile off shore, near the little trading station known as St. Michaels. This is the customary point for transferring to river steamers in order to ascend the Yukon, the nearest entrance to which is about 70 miles to the south. Owing to shallow water and the absence of surveys, ocean-going vessels do not attempt to enter any of the

many mouths into which the Yukon divides before reaching Bering Sea.

St. Michaels is considerably changed from the Redoubt St. Michaels', founded by the Russian American Fur Company in 1833. The palisade of the old stronghold is gone, but two of the block houses, pierced for cannon and musketry, still stand at the rear of more modern buildings, and occasionally serve as guard houses. The octagonal church, painted red and surmounted by the double cross of the Greek church, tell that the established religion of Russia still holds sway, although the flag of the United States floats near at hand. The settlement is still a trading post, but has passed into the hands of the Alaska Commercial Company, who, at the time of our visit, held the lease of the Seal Islands, and controlled the entire fur trade of western and central Alaska. The principal buildings are built of logs, the better ones having an outside covering of boards, and form three sides of a rectangle. The space thus enclosed corresponds in a general way to the plaza in a Mexican village, and is the scene of many picturesque gatherings.

The little settlement had just awakened from its winter's sleep, and was thronged with natives from villages scattered along the coast and from several widely separated points in the interior. The most distant travellers were from the Porcupine river to the east of the Alaska-Canadian boundary, some 1,500 miles away. Besides the natives there were missionaries of several denominations; agents of "The Company" from interior stations, miners from the gold fields on the upper Yukon, officers and sailors from the U. S. S. *Thetis*, anchored in the roadstead, a number of mechanics brought on the *St. Paul* who were to construct a new steamer for the Yukon trade, and the Coast Survey parties, numbering over twenty men. A more cosmopolitan assemblage could scarcely be found in North America outside of Alaska. The natives represented several of the subordinate divisions of the two great aboriginal stocks, Eskimo and Indian, of North America. The white men included but few native-born American, but nearly every country of Europe from Finland to Greece was represented. As is the case the world over when a band of adventurers assemble, the Jew was present, and as usual ranked among the more prosperous members of the community.

The gathering of so many strangers at St. Michaels gave the place a holiday aspect. To entertain the visitors, the traders in charge of the station arranged for a native dance in the square in front of the store, in which a score or more of the Eskimo inhabit-

ants participated. The audience consisted of white people, including the wives of some of the traders, Indians, Eskimos, children, dogs, etc., and was even more picturesque than the dancers, clad in their holiday garments of seal skin and reindeer fur. Music was furnished by a number of tambourine-like instruments, made of seal-membrane stretched tightly over a frame shaped not unlike a tennis racket, and beaten by the hand. Various phases of Eskimo life, including hunts on sea and land, were described in extemporized chants, accompanied by pantomime, in time with the music. Some of the very oldest members of the community, carried away by the excitement of the occasion, joined in the festivities, and showed how such events were celebrated when they were young, much to the amusement of the rising generation.

While the *St. Paul* was slowly discharging her freight with the assistance of lighters, and of a small steamer called the "*Yukon*," in which we were to ascend the great river after which it was named, the scientific work of the expedition was begun by Messrs. McGrath and Turner, who made magnetic observations in tents on shore. My time was occupied in tramping over the adjacent moorland and in climbing some of the low volcanic hills a few miles inland. The country about St. Michaels is typical of a vast region bordering the shores of Bering Sea and the Arctic Ocean, for which the Siberian name *tundra* has been adopted. This desolate tract is a treeless morass, carpeted with a luxurious growth of mosses and lichens, and beautified during the short summer by a wealth of brilliant blossoms. A few inches below the flower-strewn surface, however, the soil is always frozen and a sheet of ice more or less mixed with partially decayed vegetation, and of unknown thickness, underlies nearly the entire tundra country. Like the peat bogs of temperate latitudes, the plants of the tundras grow above at the same time that they die and partially decay below, but complete destruction of the vegetable tissues is arrested by the frost, and the deposit increases in thickness from year to year and from century to century. In the frozen bogs forming a belt a hundred miles or more broad, about the northern shores of both the Old and the New World, it is safe to say there is more carbonaceous matter than in the workable coal fields of America. Geologists may yet find in the northern bogs an explanation of the origin of some coal deposits. The surface of the tundra abounds in lakes and ponds, and, in fact, in many places contains more water than land; or, rather, there is scarcely any land at all over large areas, but only hummocks of wet moss into which one sinks knee deep at every step.

When preparations were finally completed and the little stern-wheeled steamer *Yukon* was loaded for the river journey, those who were to take passage in her carried their personal effects on board and settled down in the cramped and not over-clean quarters as best they could. Beside the freight stowed away, no one seemed to know where, on the steamer itself, three lighters were taken in tow, each of which was heavily laden, and served also to house the camp hands, and a few other passengers. Meals were served in the diminutive cabin of the steamer, and, as many relays were necessary, a meal, or the odor of its preparation by the Eskimo cook, seemed always in progress.

The crew of the *Yukon* consisted of a captain of Scandinavian birth, an engineer from Finland, and a dozen or more Eskimos. The natives acted as pilots, assistant engineers, firemen, wood choppers, etc., and did their work with remarkable efficiency. Even when the rough captain was too drunk to manage affairs, the crew navigated dangerous rapids, and made landings for wood, in a way that spoke volumes for their intelligence and faithfulness.

The first stage of our journey was along the coast of Bering Sea, and was a risky passage for the *Yukon*, especially when encumbered with lighters in tow. The weather was calm, however, and the water smooth. In spite of a dense fog that settled down over the yellow sea, before the passage was half completed, we succeeded in reaching Kwikhpak channel, one of the numerous streams into which the Yukon river divides on its delta, without serious delay. Low bluffs then enclosed the muddy waters on either hand, and from the top of the pilot house we could see far out over the intensely green surface of the great marsh through which we were sailing.

Slowly our little steamer struggled against the current, and at length passed the entrance of the highest of the distributaries through which the mighty river discharges its waters. The head of the delta is a hundred miles from the sea; the distance about its seaward margin is about 70 miles. Enclosed by the low swampy lands, made largely of river silt, are uplands of older date standing like islands in the sea of grass and moss.

For some two or three hundred miles above the head of its delta, the river spreads out between low shores, and in places is many miles broad; so wide, in fact, that an observer standing on the bluffs forming its right bank, cannot distinguish the land to the south. It seems like a sea of yellow water, but the current even in the broadest part is so strong that its true character is unmis-

takable. The Yukon throughout nearly its entire length is a muddy, silt-laden stream.

Stops of a few hours were made at the principal native villages, and many were the picturesque scenes that awaited us as we went ashore, and visited the fur-clad people in their homes. For a distance of 150 miles from Bering Sea the people are Eskimos, and live in comparatively well-built houses, usually situated in the shelter of some projecting headland, where fish are abundant. Food is obtained mainly from the river. Large racks filled with drying salmon sometimes gave a pink tint to the village sites before the individual houses could be distinguished.

Many of the houses were literally filled from floor to roof, with salmon hung on poles with bark troughs below to catch the dripping oil. A fire smouldering on the floor in the centre of each house, filled it with dense smoke which finally escaped through a hole in the roof. Our visits to these houses necessitated that we should crawl in on our hands and knees, beneath the mass of drying salmon, in order to reach the small open space in the centre where the people crowded about the fire. The density of the atmosphere and the indescribable odor of these combined dwelling and smoke houses usually made our visits as brief as courtesy would allow.

A call was made at the Catholic Mission near Andreieffski, in charge of Sisters whose previous home was near Quebec. The log house in which the Sisters lived had one room fitted up as a chapel, with a shrine made by a carpenter Brother. The home of these devout women was the only oasis of cleanliness that I found in Central Alaska. The largest and most interesting villages on the lower Yukon are Anvik, Nulato and Nukulukahyet, at each of which we remained for a few hours, and learned something of the people and of their country. Soon after leaving Nukulukahyet, near where the Tananah river joins the Yukon from the south, we awoke one morning and found our little steamer struggling with the strong current where the river passes between bold bluffs known as the Lower Ramparts. For an hour or more no perceptible advance was made, and at times the little boat was carried slowly down stream in spite of its quick puffing and the cloud of spray thrown up by the large paddle-wheel at the stern. As a last resort, a heavy wrench was hung on the safety valve, in disregard of all regulations of steamboat inspectors, and sufficient steam pressure obtained to enable the brave little craft to ascend the swift water and gain the broad quiet reach of the river above.

The banks of the Yukon are forested, except on the delta. In the Alaskan portion of its course the forests are dense, with thick undergrowth, but nearer its head waters the uplands are without

YUKON RIVER NEAR THE LOWER RAMPARTS.

trees and covered with luxuriant grasses. The prevailing trees are white spruce, growing in closely packed ranks, and seldom attaining large size. Aspens and willows flourish near the streams and, as autumn approaches, form a fringe of yellow along their banks. When looking down on the forest from some commanding station, the avenues of yellow outlined in the tree tops were frequently the only means of judging of the positions of the streams flowing beneath.

Many landings were made for the purpose of obtaining wood for engine fires. As trees had to be felled and cut into the required length, these delays caused a serious loss of time, but afforded opportunities for seeing something of the adjacent country. The halts for wood, however, were usually made at night when the light was too uncertain to admit of safe navigation, but sufficient, especially if increased by a blazing fire, to allow the wood-choppers to work. The night scenes when a dozen swarthy Eskimos, stripped to the waist, wielded their axes in the shadows of the dense forest, while the *Yukon* was tied to the neighboring bank, were always attractive, and rendered the tedious delays much more endurable than if there had been no activity to enliven the scene.

Throughout the length of the Yukon, one is frequently reminded of the high latitude of the region drained by the great river, by seeing strata of ice in the recently cut banks, beneath the dense layer of moss and roots forming the surface on which the forests grow. One may frequently find ice even on a hot summer's day, by scraping away the moss at his feet. In some instances the frozen layer has been penetrated to the depth of twenty-five feet, but its full depth has never been ascertained. In the banks of some of the streams to the north of the lower Yukon, strata of ice over a hundred feet thick have been observed, and the indications are that its total depth is considerably greater than the portion exposed. This sub-soil ice is stagnant, and without the characteristics of glaciers. It is thought by some observers, to be an inheritance from a former period of extreme cold; but under existing climatic conditions, when ice forms beneath a layer of moss, it is preserved during the short summer, and may increase as it does on the tundras, to an astonishing thickness.

SUB-SOIL ICE ON THE BANK OF THE YUKON.

The Yukon is covered with a thick layer of ice during the winter and in the spring thawing begins and the river "breaks up," as it is termed, on its head waters while winter still chains its lower portion. The result is that ice dams are formed and immense floods occur. The swollen waters, freighted with ice, submerge the adjacent flat lands and islands, and cut down the trees that cover them. In many places we found the trees either cut off at a general level of a few feet above the ground, or battered and worn by the ice that had pounded against them. Fragments of floating ice, frequently freighted with gravel and even with boulders three or four feet in diameter, are left on the sand flats when the flood subsides, and on melting deposit their loads in confused piles. In some instances, intersecting ridges, composed of sand and gravel that had been washed into cracks between large ice cakes, form a pattern on the shore resembling Hebrew letters. A person not familiar with the origin of their strikingly symmetrical figures, might easily fancy that they were of artificial origin, and intended to convey meaning.

During the short hot summer, in Central Alaska, when the sun scarcely descends below the horizon, insect life is abundant and mosquitoes and flies make miserable the lives of both men and beasts. When venturing into the forests we wore netting over our heads and gloves on our hands, but even then suffered from the relentless attacks of the millions of insects that swarmed on every hand. When my companions were concealed from me by dense vegetation, I could frequently locate their position by the cloud of mosquitoes that hovered over them and accompanied all of their movements. So vicious and untiring are these pests of the air that life could not be long maintained if one was not well protected from their attacks. Wild animals are sometimes worried to death by the countless hosts of winged things.

On nearing the site of old Fort Yukon, just above where Porcupine river joins the main stream, we passed to the north of the Arctic circle, but instead of experiencing Arctic severity of climate, suffered from the intense heat. The temperature in the shade was at times above a hundred degrees of the Fahrenheit scale. There was scarcely any relief from the heat at night, for the reason that practically there was no night, but only a prolonged twilight connecting the discomforts of one day with those of the succeeding day.

At the site of old Fort Yukon, of which the ruin of a chimney is now the only conspicuous object, Mr. McGrath and his party disembarked, for the purpose of making magnetic observations and beginning a survey of the Yukon river, while the steamer ascended the Porcupine with Mr. Turner's party.

The side trip up Porcupine river was wholly in Arctic lands. After ascending the tortuous stream for perhaps fifty miles, we emerged from the low forested tract, characteristic of the country along the middle course of the Yukon, and entered a hilly region where bold uplands covered with luxurious grass intervened between the forest-bordered streams. Dark spruce forests and groves of cottonwood and willows fringed the river banks and extended in narrow lines up each depression among the hills. On climbing some of the grass-covered summits rising a few hundred feet above the river, I obtained wide reaching views of the rolling uplands, bordering the winding river valley. Hills succeeded hills as far as the eye could reach. To the northwest suggestions of mountains could be distinguished through the hazy atmosphere. The aspens in the lowlands just changing to yellow-green, told that the charms of the northern summer would soon be blotted out, but the subdued

and mildly diversified landscape held naught else that suggested Arctic severity. It needed but a farm house or two with pasturing cattle in the grassy meadows, to transform the remote uninhabited land into a picture of New England.

The Porcupine, like most of the tributaries of the Yukon from the north, is a swift, clear stream, with many windings. In its upper course it flows between bold hills with but little flat land along its shores. Our little steamer, the first that ever ventured on its waters, struggled against the rapid current for ten days, when the water became too shallow to admit of farther advance.

Observations for longitude showed that we were still several miles west of the 141 meridian, which treaties have decided shall be the eastern boundary of Alaska. When the *Yukon* could proceed no further, the surveying party transferred its goods to a camp on shore, and the steamer on which I was the only remaining passenger began her swift voyage down the river. On returning to Fort Yukon, Mr. McGrath and his party took up their previous quarters on the steamer, and the journey up the Yukon river was resumed. On reaching the locality where the boundary was supposed from previous observations to cross the river, a landing was made and the boat returned to Fort Yukon for supplies that had been left there temporarily. This delay enabled me to spend a number of pleasant days at Camp Davidson, as Mr. McGrath's station was named, and to explore some of the adjacent country.

Camp Davidson had been previously occupied by a surveying party sent by the Canadian government, who built a commodious log house, in which they passed a winter. The house was still in good repair, and was at once cleared out and enlarged. An observatory of logs, built over the stump of a large tree which served for an instrument pier, was also found standing and was at once fitted up for use.

Over the large Russian stove built of stones, in the cabin, hung a magnificent pair of caribou antlers, which told that game could be expected in the neighboring forest. During my lonely climbs in the adjacent mountains, I found abundant signs of moose and bear, but was not fortunate enough to see large game. The trails of mountain sheep and mountain goats were abundant at elevations of about 3,000 feet. The river was known to abound in salmon at certain seasons, and grayling or Arctic trout, were said to be plentiful. Taking all in all, Camp Davidson seemed to be an excellent place in which to pass an Arctic winter.

When the *Yukon* returned to Camp Davidson, I bade good-bye

to my friends, who, as it chanced, remained there for two years, and resumed my voyage up the river.

The struggle of the little steamer against "strong water" was resumed; the monotony being relieved by brief stops at the widely scattered Indian villages. The few natives that we met were a low type of the great Athabaskan family, and lived in wretched villages in which the dogs, used to draw sleds in winter, sometimes outnumbered the people. The vegetation bordering the river is so dense that scarcely a trail has been made through it. The streams are the highways of travel, both summer and winter. The canoes used on the upper Yukon are built of birch bark, with sharp ends, and have a small decking of bark at both prow and stern. Occasionally they are tastefully decorated with beads or colored porcupine quills. They are even more graceful on the water than the canoes with high curved ends, familiar in the waters draining to the St. Lawrence, and so light that a man can easily carry one in a single hand. In deep water a paddle is used, but in ascending streams in shallow water, progress is made by means of two slim poles, one held in each hand of the occupant and pushed against the bottom.

A MINER'S FAMILY ON THE UPPER YUKON.

On our way up the Yukon we called at the mouth of Forty Mile creek, where there are a few log houses and a store. This is the centre of trade for the gold fields on Forty Mile creek and neighboring streams. Gold is found in the gravel along the upper Yukon and many of its branches over a wide area, but owing to the severity of the winters and the high price of provisions, only the richest "washings" have as yet received attention. The miners are a rough, hardy race, made up, it would seem, of representatives of nearly every nation on earth. Some are typical frontiersmen, dressed in buckskin, who are never at home except on the outskirts of civilization. Others were of doubtful character and it is said are seldom known by their rightful names. The remote gulches of the Yukon country seem to offer safe asylums for men who are "wanted" in other districts. Despite the varied character of its inhabitants, this remote community is orderly and but few dis-

turbances have been known. Summary punishment would follow any breach of the public peace. Morality, as understood in more refined communities, is conspicuous by its absence. Many of the miners and traders throughout the length of the Yukon live with Indian women and many are the bright-eyed half-breed children to be seen in the villages. In some instances these unions are legal marriages, but in the majority of cases the Indian mother is deserted after a year or two, when the spirit of adventure leads her companion to other diggings or to fresh hunting grounds.

After leaving the isolated community at Forty Mile we called at the mouth of Stewart river, where there is another trading station, and also at Fort Reliance, which is now abandoned. As the weather was stormy our captain ordered his men to tear down the only remaining house that marked the site of the old post, which figures somewhat conspicuously in the local history of the region. This vandalism was regretted by the hunters and traders who were present, as the house was the only refuge for many scores of miles.

On the first of September, we reached the mouth of Pelly river, opposite the site of old Fort Selkirk. Many names to be seen on the maps of the upper Yukon are records of the western advance of agents of the Hudson Bay Company; in the same way that the unpronounceable names on the lower arms of the same stream indicated the former presence of the Russian American Fur Company.

Fort Selkirk was the highest point that our steamer was to endeavor to reach, and was far beyond the limit of any previous voyage. It is not the head of steamboat navigation, however, as a light-draft boat, provided with good engines, could certainly ascend as far as Miles cañon and probably even beyond. At our last landing, Mr. Harper, a trader, who had been our fellow-traveller, and his Indian wife and several interesting children, went ashore with his large outfit of trading goods, and at once began preparations for establishing a frontier store in the wilderness. The locality chosen was in a dense forest on the right bank of the river, opposite old Fort Selkirk, the chimneys of which are still standing. A more unpromising place, to an inexperienced eye, for a store could scarcely be fancied. For fully a hundred miles before reaching it, we had not seen a human being not connected with the *Yukon.* Prolonged whistles from the boat, the usual signal for calling the natives, were not answered by a single canoe; and after continuing my journey up stream, I saw scarcely a score of Indians before reaching the coast. The forest where the new station was to be established was tangled and moss covered, and the ground elevated

only a few feet above the summer stage of the stream. Marks on the trees told that floating ice during spring freshets was piled high on the shore. In spite of these discouraging signs, however, the hardy Scotchman, who by the way, was one of the most genial and best informed men that I met in Central Alaska, went quietly on with his preparations for passing another winter as he had done many previous ones, in the solitude of the wilderness. The inducement that lures traders to such remote localities is, of course, the rich furs, at present, with the exception of gold, the sole export of the Yukon region. Beaver, otter, foxes, mink, martin, wolverine, bear, wolves, etc., are more or less plentiful throughout the entire water shed of the Yukon. The skins of these animals are purchased from the Indians, with flour, cotton cloth, tea, and other articles used in domestic life. To the credit of the traders engaged in this occupation, it may be said that they seldom offer the natives "fire water" in exchange for furs.

On reaching Harper's station, I made arrangements with four miners, who had taken passage on the *Yukon* at Forty Mile, to continue on up the river in their company. The most interesting portion of my trip now began. The open boat built by the miners when they began the descent of the Yukon some eighteen months previously, was repaired and the seams covered with pitch gathered from neighboring spruce trees. Supplies were purchased from Mr. Harper, and the long and difficult journey of several hundred miles against strong currents began.

MINERS ASCENDING THE UPPER YUKON.

Each of my companions was provided with a strong pole, about ten feet long, furnished with a spike at one end. Armed with these, two of the men took their stations in the prow of the boat and two in the stern, and by pushing with the poles on the bottom or against the river bank, the boat was forced along. In this mode of navigation the most experienced polemen occupy the ends of the boat and guide its course. To handle a boat in this manner requires even more skill than when oars are used. Especially is this true, when rounding headlands about which the current is swift. Sometimes when with great labor we had succeeded in

nearly passing a beetling cliff, the rear poleman would be unable to turn the prow towards the bank by forcing his end of the boat out from the shore, and the strong current would immediately sweep us out into mid-stream, where the water was too deep for the poles to reach bottom, and we would be carried far down the river before the rude oars could be brought into play. When swept away from the bank in this manner, we would row across to the opposite shore, usually the concave side of a sharp curve, where eddies tending up stream were to be expected and in the shelter of the next projecting headland regain the space that had been lost.

When the character of the shore would permit, a towing line would be fastened to the side of the boat and the four men would "track" along the bank, while I remained in the boat and guided her course with one of the poles. In this manner we could frequently make better progress than by poling, but, unfortunately, the vegetation overhanging the banks was usually too dense to admit of tracking for any considerable distance.

At noon we rested and cooked a dinner over a small fire, and at night, encamped beneath the shelter of the trees, usually at the lower end of an island, and slept in our blankets on the thick moss, without the protection of a tent. When the weather was stormy, the sail of the boat would be stretched on poles so as to form a "lean-to" and a large fire built in front. With the advance of the season the nights became cold, but this was favorable to us, as the mosquitoes ceased their ravages and allowed us to fully enjoy the beauties of the rugged land through which we were voyaging.

At three localities, viz.: Five Finger rapids, Miles cañon, and at the foot of Lake Lindeman, we were obliged to remove all of our things from the boat and make a portage. At the first-named locality our "outfit" had to be carried over a bold, rocky promontory, while the boat was taken around the point against the surging waters by means of ropes. At Miles cañon the boat itself had to be taken out of the water and carried overland for about a mile. This was the most laborious portion of the journey, but fortunately, we had then been joined by two other parties of miners, numbering six men in all, bound in the same direction as ourselves. By uniting our forces the labor of portaging was lightened for all.

As we neared the end of our journey we entered a region formerly covered by glaciers, and, as is usual where ice sheets have recently departed, found the scenery diversified by beautiful lakes. By means of sail and oars we passed through Lake Lebarge, Lake

Marsh, named in honor of the distinguished professor of palæontology at Yale, Lake Tagish and Lake Lindeman. This portion of the journey was especially enjoyable, as a rest was afforded from the extreme fatigue of forcing our way against the tireless current of the river. The shores of the lakes were gorgeous with autumn foliage, and the air cool and bracing. A few natives were met with in this portion of the route, and although sullen and far less friendly than the inhabitants of the villages farther down the river, they gave us no trouble, but added a touch of life to the wild scenery.

As we neared the head of the river the hills became bolder and more rugged, and glimpses could be had of snow-clad mountains to the southward, across which we must pass before reaching the outskirts of civilization. The prevailing mild and dry summer weather of the interior gave place to clouds and rain. Awakening one morning in a camp beneath spreading spruce trees, on the shore of Lake Tagish, we found our blankets weighted down with snow and the entire landscape white as in mid-winter.

In making the short passage between Lakes Tagish and Lindeman, we suffered the only serious accident of the entire trip. One of the boats was capsized in the swift torrent, and swept against a huge rock with such force that it was crushed and its contents lost. The end of our journey by river was near at hand, however, and the accident did not cause delay.

On reaching Lake Lindeman an hour of hard rowing against a squall from the mountains, and our boat grated on the gravelly beach at the head of the lake, and our boat trip was ended. The country about Lake Lindeman is forested, but the trees are mostly small, and the upper limit of arboreal vegetation on the "timber line" can be seen on the mountains to the south at an elevation of perhaps a thousand feet above the lake's surface. There were no signs of human habitation about the lake. The smoke of our camp fire was the only evidence of life in the wild, dreary landscape. Our boats were taken out of the water and cached in neighboring thickets, together with many articles that could not be carried over the mountains. Although our long journey was nearly ended, so far as measurements in miles was concerned, we had still a difficult and but imperfectly known mountain pass to cross, on which the snows of winter had already begun to accumulate.

At Lake Lebarge we met a single miner who had just crossed the pass to the south, and was on his way to Forty Mile, to try his chances in the alluring gold fields. This fortunate meeting enabled us to purchase a few much-needed supplies, and also to obtain

assistance on the first march up the mountains towards Chilkat pass.

On gaining the highest available clump of balsam trees, we cleared away the snow, then about ten inches deep and still falling, and made preparations for passing the night. We were without anything resembling a tent, so that "going into camp" consisted in building a fire and finding a somewhat sheltered place in which to sleep. I selected a thick low-branching balsam for my house. The lower limbs were cut away and served for a sub-stratum for my bed, while the higher branches retained much of the falling snow. I slept soundly, and on awakening next morning found my bed deeply covered with snow. My blankets had served me on many expeditions for over ten consecutive years, but in spite of some sentiment for them, I was obliged to leave them in this the last of many camps where they had sheltered me.

With a cup of tea and short ration of frying-pan bread and fried bacon for breakfast, each man took a light load of articles that to him seemed most valuable, and we started in single file for the pass. To most of my readers, I fancy, that party of eleven men tramping through the snow, each with a pack on his back and a rude staff in his hand, and dressed in varied costumes that had seen months if not years of hard service, would have appeared as wild and pioneer-like as could well be imagined. The weather was cold and stormy. A chilling wind swept down from the icy mountains, of which only occasional glimpses could be seen through the dense clouds covering their summits. Snow fell from time to time, but between the fierce squalls the sun shone out bright and clear, and revealed fleeting pictures of the rugged land below us to the north. Our course led upward over glaciated rocks, and across snow-filled valleys, toward the dense cloud banks that veiled all beyond.

My companions had crossed the pass on entering the Yukon country, but only one of them had even approached it in the direction we were now travelling, and none of them seemed confident of finding the way when the mountains were cloud covered. After many weary hours of tramping over the roughest of country, where only traces of a trail could occasionally be had through the freshly fallen snow, we gained the base of the heavy cloud banks concealing the mountains. In deep gorges leading upward between neighboring peaks we could see blue glaciers, looking like frozen cataracts descending from unseen regions beyond. In the obscurity of the clouds that enveloped us all was dark and uncertain. Every vestige of a trail had disappeared, and no one knew which of the black

gulches about us would lead to the trail on the other side of the pass. While consulting as to the best plan to follow, some counselling a return to our blankets, where rations sufficient to maintain us for a day or two had been left, I noticed a flock of geese approaching from the north bound on their autumn navigations. They were flying low, just beneath the base of the outward-reaching clouds, and I fancied would choose the lowest gap in the mountains for their passage. In this I was not mistaken, although my companions, not aware, perhaps, that geese once saved Rome, refused to follow the lead of a guide they considered so stupid. After two or three vain trials we again found signs of a trail, and were soon in a narrow gorge with towering peaks on either hand, the summits of which were lost to view in the clouds. After crossing the névé of a small glacier so completely shrouded in mist that but little of its character could be seen, we travelled on over smooth bare rocks, and were rejoiced to find that the next stream we reached was flowing southward, and that we had actually crossed the divide between the waters of the Yukon and the streams flowing to Lynn canal. Descending rapidly, along an exceedingly rugged trail, we were soon below the clouds, and a drizzling rain reminded us that we were on the Pacific slope, where days of clear weather are few. As night approached we gained the upper limit of vegetation. Another hour of hard tramping brought us to a dense growth of hemlocks, sheltered in a wild gorge through which a roaring torrent was plunging down to join other similar streams below. Selecting an aged evergreen, whose wide branches reaching far out from the moss-covered trunk touched the ground, we placed our packs beneath it, and cutting a dead tree that stood near, soon had a blazing fire in front of our retreat. Without tents or blankets, and with only a little bread that we carried in our pockets, and a drink of tea for supper, we lay down on the thick, water-soaked moss, each man with his head toward the tree that sheltered us and his feet toward the semicircle of fire, and slept. During the night, as one or another of the party awoke from his uncomfortable slumbers, he would replenish the fire, and, perhaps, stand in front of the cheerful blaze until his benumbed limbs were warmed before joining his slumbering companions.

Of all the wild pictures of camp-life that linger in my memory, there are none more striking than our bivouac beneath the dark hemlocks of Taya valley. My companions, rough and uncouth as men could well be, had been absent from civilization at least a year and a half, and some of them for three years. Their hair and

beards had grown long, and their faces were tanned and weather-beaten by constant exposure. Their garments, then in the last stages of serviceability, had been made by those who wore them, from any material that chanced to be available, from buckskin and fur to flour-sacks, and had been repaired without regard to color or texture. Lying in many positions beneath dripping boughs, with the fire light streaming over them and gleaming on the falling rain drops, they made a picture of frontier life as wild and picturesque as could well be fancied. One not accustomed to the vicissitudes of exploration, coming suddenly on such a scene, would certainly believe he had stumbled on a band of the most desperate outlaws.

When the morning dawned and one after another of the moss-grown trees about us became visible through the white mist, we ate a hasty breakfast, even more frugal than the supper of the previous evening, since only remnants of the former meal remained, and resumed our march. Forcing our way through the wet vegetation we were drenched to the skin, but this was of little moment, since the stream we were following swung from side to side of the valley, and had to be forded many times. The crossing of a rushing torrent of ice-cold water from two to four feet deep is by no means a pleasant experience, neither is it unattended by danger, as was testified by the grave of at least one man, who had been drowned in making the attempt.

There are two ways employed by frontiersmen in crossing dangerous streams when ropes are not to be had. One is for each man to provide himself with a stout stick, answering to an alpenstock, and for all of the men who are to cross, to hold their sticks horizontally before them with their ends overlapping and tightly grasped, thus making practically one continuous pole. The party then enters the stream abreast, and wades slowly across, the tallest and strongest man being placed at the upper end of the line, where the greatest force of the water is experienced. The second plan is to overlap alpenstocks as before, but to enter the water in single file, at right angles to the current; in this way a part of the men are on firm ground in shallow water, and can assist those struggling against the swifter portions of the current.

During our last march we had to cross Taya river some eight or ten times in the manner described above, and for once experience did not breed contempt. Benumbed by the cold, each fresh plunge into the icy waters seemed more trying than the one that preceded it. At last, however, when fatigue and lack of food had begun to

tell on our strength, we saw before us the welcome sight of a chimney rising above the foliage, and in a few moments gained Chilkat village, and found food and rest at the trading post kept by Mr. Haley and his kind-hearted wife.

My companions left the next day or the day following in boats bound down Lynn canal, for the town of Juneau, but I remained a few days for rest and with the aim of seeing something of the mountains and glaciers, for which Lynn canal is justly famed.

A day of brilliant weather, during which I climbed a neighboring mountain peak, more than repaid for the delay. At an elevation of 3,000 feet I crossed the névé of a small glacier and obtained an unobstructed view of the magnificent ice-crowned mountains in which the ancient river valley, now occupied by ocean waters and known as Lynn canal, was carved. From one locality I counted forty glaciers, some of them several miles in length, and a change of position brought still others into view. The outlines of vast amphitheatres could be traced by lines of crags and rock-pinnacles, but the great depressions themselves were filled to overflowing with ice.

On the sides of Taiya valley the upper limit of timber growth or the "timber line," is sharply drawn at an elevation of about 2,500 feet. Above that height the mountains are stern and rugged, while below there is a dense forest of aged hemlocks, festooned with moss. On the day that I looked down into this seemingly enchanted valley the air was clear and sunny in the upper regions, but the great gulf below was filled with drifting vapor. At one moment nothing would be visible but the sombre forest, through which the white vapor was hurrying; and the next, the veil would be swept aside, revealing the mountain spires, snow pinnacles and torquoise-tinted cliffs of ice towering heavenward. These rapidly changing pictures, seen through cloud rifts, seemed glimpses of another world.

Space will not permit me to detain the reader longer. Returning from the mountains I resumed my journey. With a single Indian I made a canoe trip down Lynn canal, a distance of over 100 miles, to the little mining town of Juneau, and from there returned to Puget Sound by steamer.*

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* Some account of observations on the geography and surface geology of Alaska, made during the journey described above, may be found in the Bulletin of the Geological Society of America, Vol. 1, 1890, pp. 99–162.

THE COMPOSITE ORIGIN OF TOPOGRAPHIC FORMS.

BY

ALBERT PERRY BRIGHAM.

The genetic method cannot be neglected by the modern geographer. Topographic form is sure to raise the question of origin. The analysis and classification of such forms can scarcely proceed on any other basis, as even casual reference to the literature of the subject will show.* With the untrained, but interested observer, as well as with the scholarly student of nature, the first question is,—how? Every form is dependent on material and structure and is the resultant of a group of forces acting conjointly or in close succession, and in varying proportion of efficiency. Every teacher finds increasing difficulty in referring forms truthfully to the agents that moulded them. He is aware that he supplies the beginner with a crude classification which will be modified as the student becomes able to grasp the complex history of the form under consideration. Wider observation will always supply a graded series incapable of hard and fast grouping. The genetic series is comparable to those of the organic kingdom, and Darwin's remark on the increasing difficulties of the young naturalist as he surveys increasing numbers of related specimens is equally pertinent here. The interdependence also, of biologic, groups, in the struggle for existence, finds a close parallel in the geographic field.

There is, at the present time, increasing recognition of certain form-making agents which have not heretofore received due attention. Eolic geology is one of these little tilled fields. Le Conte's larger work dismisses the subject with less than a page. The formation of dunes and the effectiveness of the natural sand-blast, in certain situations, comprise nearly the whole body of published fact until quite recently. Yet the total of wind action in transporting material and in completing the sum of topographic expression cannot be otherwise than very great. At the late Baltimore meeting of the Geological Society of America Mr. G. K. Gilbert pre-

* See as examples, The Classification of Lake Basins, W. M. Davis, Proc. Boston Soc. Nat. Hist., Vol. XXI, 1882; also, Proposed Genetic Classification of Pleistocene Glacial Formations, T. C. Chamberlin, Jour. Geol., Vol. II, pp. 517–538, July–Aug., 1894.

sented a paper on the Formation of Lake-basins by Wind, in the arid regions of the West. Mr. J. B. Woodworth has recently published a useful discussion of wind work in New England,* and Mr. J. A. Udden has set forth the laws of the erosive and transporting work of the atmosphere.† The co-operation of the atmosphere with water in the constructive and destructive movements of waves, also, has been taken for granted rather than recognized at its true value. It is not too much to say that the structure and surface of all terranes, ancient and modern, have been affected by eolian action.

Anthropic geology has not fared much better, though Professor Marsh's Man and Nature marks a somewhat early attempt in the right direction. It seems safe to say that, by deforesting and by tillage, man has doubled the rate of surface degradation over large tracts of country. By his means, gravity, the winds, atmospheric erosion and the mechanical work of rain and streams have been multiplied in effectiveness, as is witnessed by streams which run full loaded after each shower, whereas before man's occupancy of the field their crystal clearness was rarely dimmed. That man is the central theme in geographic study would scarcely fail of recognition by any, but that he is an actual maker of topography probably occurs to few who are not students of earth forms. Even such would fail of the truth, if they are accustomed to view such forms as dead, or as apart from a constant and most complex historical development.

The principle of composite agency applies to continental evolution in general. The building and uplifting processes unite with the down-wearing processes. Constructive work is accompanied by degradational activity in ever shifting proportion. Thus the making and distribution of sediments involves the nature and extent of previous land surfaces, the plan of their drainage systems, the character of the sea floor, the direction and power of winds, currents and tides. The nature of the sediments, rapidity of accumulation and other conditions, regulate consolidation. The rate and character of the force which turns this sea bottom into a land surface is then to be considered, and vulcanism may enter at any time to vary the assemblage of material and add new elements of structure to the mass. We will suppose the above network of

* Post-glacial Eolian Action in Southern New England, Am. Jour. Sci., Vol. XLVII, pp. 63–71, Jan., 1894.

† Erosion, Transportation and Sedimentation Performed by the Atmosphere, Jour. Geol., Vol. II, pp. 318–331, Apr.–May, 1894.

agencies to have been operative, with a resulting land surface of average continental relief. The forces which must already have begun the process of base-levelling will be followed up in certain directions in illustration of our theme. The history of a cycle of base-levelling is the joint product of structure and erosion. But as structure is a composite affair, so general erosion is accomplished by many agencies, and is accompanied by many episodical constructional processes and forms.

The distinction between hard and soft, or better, between rocks more and less destructible by erosive agencies, finds illustration in all topography. Thus Geikie says:* "This relation between relative destructibility and external configuration is traceable in every part of Scotland, and indeed may be regarded as the law that has mainly determined the present topography of the country." The author describes the marked contrast between areas of ancient sandstones forming terraced cones or pyramids, and the yet more ancient gneisses, wrought into a "tumbled sea," by a compound of weathering, sea action and glacial grinding. The topographic resultants of variant horizontal beds may perhaps be best studied in Western America. Dutton's Tertiary History of the Grand Cañon District is little else than an amplification of this theme, and to this may be added every illustration of Bad-Land topography in our official surveys of the West. Hardly less instructive are our more modest, and often glacially modified or obscured "escarpments," in regions of horizontal sediments in the East. Gilbert has shown how the rapid erosion of the upper member of a topographic series, will modify the conditions for all lower members, in a given drainage basin: "As any member of the system may influence all the others, so each member is influenced by every other."† This well emphasizes the difficulty of adequately stating all the conditions of even the simplest topographic problem. The variant characters of igneous rocks and their relations to inclosing, or subjacent sediments, show beautifully the topographic importance of rock characters. Thus we may compare the rhyolitic tables and mesa caps of Colorado with the rugged needle-shaped peaks of the San Juan, hewn from vast sheets of andesitic lava, or we may put over against these the characteristic granitic domes of the Platte Valley in the same State. Geikie notes this weathering of granite in his account of the Highland Hills,‡ where he

* Scenery of Scotland, p. 108.

† Geology of the Henry Mountains, pp. 123–124.

‡ Scenery of Scotland, p. 199.

describes it as "a rock which, from its usual decomposing character, and its abundant vertical joints, combines in its decay a grandeur of lofty cliff with a smoothness of mountain top such as none of the other Highland rocks can boast." Becker illustrates the same law in the Sierras of California.* The same writer† notes the topographic effects of horizontal lava capping. If lava sheets be poured out upon a surface, or intercolated between beds of sediment, and the whole mass moderately tilted, we have the conditions presented by the trap sheets of Connecticut and New Jersey. We may compare the structure of Salisbury Crag and Arthur's Seat in Scotland,‡ the former being due to an intrusive sheet, while the latter is a solitary mass or boss. In such cases the topographic result would vary with the relative hardness of the lava and the sediments, the relative thickness of the two, the number of alternations between them, the amount of tilting and the subsequent lapse of time.

The same considerations apply if the entire column is sedimentary. As already noted, the variety of result may be very great, if the beds weather and are dissected in their original, approximately horizontal attitude. If we break them into crust blocks and tilt them, we get a type of mountain and valley illustrated in the Great Basin. If we fold the series we introduce infinite possibilities in topographic history. Some of the factors are: (1) Direction of application of the force, determining the chief lines of mountain and valley, as in the main trends of Scotland and the Appalachians; (2) Ratio of force to resistance of beds, in virtue of their hardness or thickness, thus determining the folds as open or close, reversed or faulted; (3) Rate of application of the force as compared with the sum of erosive energy, determining whether the antecedent drainage system shall survive the change of conditions; (4) Presence or absence of hard beds of good thickness to act as topographic determinants of the main ridges and included valleys.

In such a region of anticlinal and synclinal axes, topographic development and interest centre in the drainage history, as controlled by the above-named dynamic and structural factors. Henceforth amount of seaward slope, climate, and character of beds in detail determine the river history; and the cutting down and

* The structure of a portion of the Sierra Nevada of California, by G. F. Becker, Bull. Geol. Soc. of America, Vol. 2, p. 69.

† Op. Cit., p. 66.

‡ Scenery of Scotland, pp. 333 and 356, and folding geological map with sections at close of volume.

broadening of valleys, the reduction of summits and slopes, headwater capture and lateral migration, with transport and incidental new constructional forms of the "waste of the land," are steps in the progress toward ultimate base-level.

Powerful as structural factors are, it is important to recognize the limits of their efficiency. By submergence, sedimentation and recovery, a new drainage system may be superimposed upon an old one, with disregard of the old structural and erosion features, at least until the work is again far advanced. In warm and moist climates topography is probably less dependent upon structure. Greater altitude with its attendant conditions may overrule structure, as in the striking case described by Gilbert in the Henry Mountains,* where Mount Ellen, altitude 11,250 feet, has a smooth crest and even slopes, and Mount Holmes, altitude 7,775 feet, is ribbed with ragged dikes, etched into high relief. The difference is due to the moisture and vegetation of the higher altitudes.

As has been elaborated by Davis and others, a normal cycle of geographic development may be interrupted by oscillatory movements of a decided character. If the movement be downward, erosive work is retarded and the area will exhibit a system of fiords about its seaward margin; or, if base-level had been approximated, it is conceivable that the resulting peneplain might be carried beneath the sea, or so nearly that the waves would complete the work by forming a plain of marine denudation. If the movement were an upward one, the base-levelling forces would increase in energy as a greater task was given them, and if a peneplain had been formed, it would become an elevated plateau subject to vigorous erosive dissection. From this dissection a secondary base-level of part of the region concerned, would in time result. This might go on until the entire plateau were destroyed, or another uplift might ensue, carrying up the second base-level some hundreds of feet above the sea, and at the same time lifting the remnants of the original peneplain correspondingly higher. This is the actual history of the Southern Appalachians since Cretaceous time.† Such a history would probably be always complicated by many minor oscillations, and by varying degrees of oscillation, producing deformation in parts of a given area. To sum up these remarks on the base-levelling process in general, we may say that the finest illustration

* Geology of the Henry Mountains, pp. 117–120.

† See Geomorphology of the Southern Appalachians, by Willard Hayes and Marius R. Campbell, Nat. Geog. Mag., Vol. VI, pp. 63–126.

of our thesis is the rare completion of base-level, or the critical balance between uplift and denudation, each checking the other, marked upheaval occasioning rapid degradation, resulting always in a limit of altitude and medium of climate, favorable to organic life.

I propose now to review certain special classes of topographic forms from the point of view of their composite origin. These forms have already been called episodical, as related to the general history of the land.

Probably no better illustration of our principle exists, than the fresh-water deposits of the ice time. Here would be noted especially the topographic individuals known in current terminology as kames, eskers, frontal aprons, fossil deltas or sand plains, valley trains, and beaches and bottoms of glacial lakes. These are water deposits, but due to water complicated with effects of ice mass and movement, and pre-existing topography. The study of earth forms has few passages of greater interest than the early attempts of geologists to deal with kames. Kames is a Scotch term applied to assemblages of short, conical, often steep hills, built of stratified materials and interlocking and blending in the most diversified manner. They offer a group of features which can but strike attention, but whose mode of origin has as yet no place in the common teaching of Physical Geography. They rarely fail of being opened, for the hauling of sand and gravel, or for purposes of interment, and are always and truthfully ascribed to water action, but they are imperfectly seen, the imagination is not exercised, the reason is left unsatisfied, and their educational value is lost, because their composite history is rarely known, and therefore is not taught, save in the higher grades of instruction. One of the earliest allusions to these hills as forming a district class, is found in the Geology of New York.* Of greater interest, as grappling with the problem of origin, is a passage in Hitchcock's Report on the Geology of Massachusetts.† "That they were the result of running water, no one who has seen them can doubt . . . . But they occur on a scale so immensely larger than anything now witnessed, that the mind is led to inquire whether they could have resulted simply from running water." Dr. Hitchcock shrewdly adds, a few lines later, "There is another agency which I have often suspected may have been concerned, and that is ice." But the discussion shows that true notions of the conjoint action of

* Vanuxem, Geol. 3rd Dist., pp. 218–219.

† Vol. II, pp. 366–370.

water and ice were not, as indeed they could not then be, in the author's thought. And it must be confessed that the study of existing glaciers has yet to proceed considerably, before we can have a clear and satisfying mental picture of the formation of kames.

The kames afford a further illustration of our main theme. It is sometimes held that they yet preserve their precise constructional form, and that the recency of the ice invasion is proven by their unbroken, flowing contours. That they are not often channelled by erosion is true. But this may be due to want of gathering surface for streams upon their small summits. On general principles one would expect a notable softening of outlines by creep and rain wash, even if these mounds date no farther back than eight or ten thousand years. Illustrations from regions of active glaciation, notably one of Professor I. C. Russell's photographs of morainic kame from the Malaspina glacier, add force to the suggestion. Thus the kame is a very complex product of water acting under glacial conditions, and of subsequent moulding influences.

The same kind of illustration is afforded by the esker, a rectilinear, or curvilinear ridge of discordantly stratified material, being in structure like the kame, but having a topography of its own ; also by the fossil delta, or sand plain, described by Davis and others, and dependent upon a group of topographic and other conditions accompanying the retirement of the ice.

Even the moraine, so often thought to be a simple mass of bowlders or bowlder clay, and solely the work of ice, is as good a type as any of composite genesis. Both the constitution and the surface expression of moraines depend on the local lithology and topography, and morainic accumulation must often be said to consist, for the major part, of washed and stratified material. A shoved moraine of true till may be worked over and deposited as kame or esker, without losing all of its finer constituents, and without complete obliteration of the glacial gravings upon its pebbles. On the other hand, a mass of kames may be pushed up into a true shoved moraine, losing its structure, but retaining the coarseness and water-worn character of its fragments. Many of the gravel beaches of the New England coast are fed from drumlins or other masses of till, giving us shore deposits of glacio-marine origin.

Glaciation as a whole is a vastly important geographic agent, and its results are curiously interwoven with conditions of pre-existing topography and post-glacial activity. The same principle is

strongly suggested in the causal field of glacial geology. Few geologists would, I suppose, give in their adhesion to a purely astronomic cause, and equally few would care to deny that celestial changes may have had some efficiency. If, on the other hand, a majority incline to geographic causes, the field for complex action is narrowed, but hardly simplified. We may indeed, with some freedom, assert the complexity and consequent difficulty of all great world-shaping forces. It is the same whether we study glaciers, volcanoes, earthquakes,* or the continents.†

The co-operation of other agencies with streams in valley making is an important illustration of the general principle with which we are dealing. In the earlier days of geology, when valleys were attributed to every agent but the streams which were at work in them, it was natural that the advocates of the new doctrine should exaggerate the efficiency of the stream. This inadequate view has not, at least until recent years, been suitably qualified by attention to other agencies, such as are covered by the broad term weathering.‡ The best illustrations of this truth are found in the talus slopes, bordering the base of cliffs, awaiting the river's first service, not abrasion, but transportation; and further, in the fact that river valleys are often narrow in hard rocks and wide in soft rocks, as is true of the Hudson of the Highlands compared with the Hudson of the Catskill region.§

The structures, to which we may apply in its broadest sense the term terrace, afford a good illustration of our principle, whether we note the variety of causes which may introduce horizontal elements into the landscape, or consider the network of agencies to which a single sort of these structures is often due. Thus we may have the terraces described by Chamberlin as morainic,‖ formed on the flanks of ice tongues, graduating at one end into the moraine, and becoming a smooth bench at the other. Other benches are due to glacial fluting and appear as rock shelves more or less mantled with unconsolidated material. They range in all

* See Report on the Charleston Earthquake, C. E. Dutton, 9th An. Rep. U. S. Geol. Surv., p. 211.

† Continental Problems, Presidential Address by G. K. Gilbert, see Bull. Geol. Soc. of America, Vol. 4, pp. 179–190.

‡ See "The Geological Dates of Origin of Certain Topographic Forms on the Atlantic Slope of the United States," Bull. Geol. Soc. of America, Vol. 2, p. 579; also a passage by the writer, "Rivers and the Evolution of Geographic Forms," Bull. Am. Geog. Soc., Mar., 1892, pp. 6–8.

§ W. M. Davis, Bull. Geol. Soc. of America, Vol. 2, pp. 570–571.

‖ Term. Mor. Sec. Gl. Ep., 3rd An. Rep. U. S. Geol. Surv., p. 304.

degrees of variation, from approximately horizontal to the typical drumlinoid curve, and when of the former sort may closely simulate benches of diverse origin.

We have also to note again in this connection the differential weathering of undisturbed sedimentary beds of varying hardness, giving rise to rock platforms and associated escarpments of varying height, according to the thickness of the beds or the frequency of their alternation. Geikie describes comparable structures etched from lava beds of "variable destructibility" in the Isle of Eigg* and in Skye. These are further illustrations of the importance of general weathering in the genesis of our geography. It is probable that many benches are a composite of differential weathering and glacial fluting, the character of the platform depending on the relative importance of the two, and upon the more general features of the pre-glacial topography. If weathering were extensive and glacial action moderate, we should probably find broad benches, approximating the horizontal attitude. If glacial action were in excess, the resemblance to the terrace would be lost in the approach to the drumlin contour.

Marine and lacustrine action give origin to other horizontal platforms. If these are in close association with the ocean, they are readily referred to their cause. If, however, they are far inland and do not afford marine fossils, their interpretation is less simple. Thus, Professor Spencer holds as marine many high level beaches about the Laurentian basin which the majority of observers connect with glacial lakes. In all cases of lacustrine and marine platforms the type varies with the topography, the character of the materials carved out and transported, and the direction of prevailing winds as compared with the trend of the shore lines. According to situation, we shall have "wave-cut," or destructive beaches, or wave-built,—constructive beaches. In the case of inland beaches suspected to be of marine origin, the detrital platform may be either truly marine, or estuarine, the decision resting both upon topographic relations and upon the nature of the fossils. In the case of the lake, the beaches may have been more or less isolated from bodies of water by desiccation, as in the case of Lake Bonneville; by retirement of ice barriers, as most hold regarding Lake Agassiz and Lake Iroquois; or by sedimentation and drainage, as is true of vast numbers of the smaller extinct lakes.†

* Scenery of Scotland, pp. 217–218.

† For a full discussion of Lake Beaches, see Topography of Lake Shores, G. K. Gilbert, 5th An. Rep. U. S. Geol. Surv., pp. 69–123; or, Lake Bonneville, Monograph I, U. S. Geol. Surv., pp. 23–89.

If we turn to river terraces, the complication of causes and resulting structures is quite as noteworthy. At the outset we have to note two classes, in which results differ according to the material in which a river works. If it be the bed-rock of a region, we have "terraces of planation."* If terraces be carved from loose valley filling, they are then called alluvial terraces. The paper to which reference has just been made, suggests some facts pertinent to our discussion. Thus the writer, alluding to phases of river work in successive geographical cycles, says (p. 258): "Involved terraces, or, as it seems better to call them, complex terraces, are due to a combination of causes acting jointly or in succession, and continuing through the whole or part of one or more geographical cycles. If we could know all the factors that have determined the formation of most of the terraces we see at the present day, I think that we should find them to be better classed as complex terraces than under any other heading in the classification thus far proposed." Upward and downward oscillations controlling the gradient of streams, nearness or remoteness of divides, character of adjacent river basins, changes of climate, involving glaciation or variation in rain-fall, the relation of a river to its tributaries, and the character of the rock-beds upon which it does its work, are all factors of importance in making a given terrace what it is.

A further illustration of complex origin is afforded by lake basins. In a former bulletin of this Society, the writer has discussed the composite genesis of the Finger Lake basins of New York.† The view is taken that the depressions were initiated by preglacial river work, which of itself is a highly composite factor. A portion of the valleys was deepened, within limits largely determined by the character of the local terranes, by glacial action. Dams of greater or less height were then created by fillings of ground moraine, the basins were deepened by recovery from northward continental depression, and the final touches were put upon them by sedimentation, wave erosion of shore cliffs and a small down-cutting of their outlets.

The strenuous holding of opposite views of the making of the Great Lakes affords a presumption, at least, of their composite origin. And it would be rash to deny that river erosion, general weathering, glacial scooping and blockade, warping of the crust, and differences between the various Paleozoic and pre-Paleozoic

* See Geographical Development of Alluvial River Terraces, by Richard E. Dodge, Proc. Boston Soc. Nat. Hist., Vol. XXVI, p. 258.

† Bull. Am. Geog. Soc., Vol. XXV, No. 2, 1893.

terranes have all had some important share in the great result. The elaborate nature of the Great Lake problem has been well set forth in a paper by Professor I. C. Russell.* The paper is not intended to embody a theory, but to state the conditions of the problem. I quote a single passage (p. 398) as in point here: "As the case stands at present it appears that there is evidence of a pre-glacial valley or series of valleys as has been claimed by several geologists, and that all but the boldest features of the old topography have been obliterated or greatly modified by glacial erosion followed by glacial and other sedimentation. Additional observations should show somewhat definitely the amount of work assignable to particular portions of the history. How far the results of subaërial and of glacial erosion have been modified by other agencies, more especially by orographic movements, has also to be considered." The late Dr. J. S. Newberry represents the extreme advocacy of the glacial origin of these great features of American geography, while Professor Spencer denies for the most part the efficiency of ice, holding to river erosion, sea invasion and crust movements. We may expect that these and other agents and conditions will be well averaged when the verdict is made up.

We take, in further illustration of composite origin, the cooperation of agents in certain extensions of continental borders and in developing insular masses. Le Conte's account of the growth of Southern Florida is a good case.† He notes first the formation of a sub-marine bank by the Gulf Stream. Corals then gain a foothold and add their hard framework and more or less comminuted debris to the pile. The coral and other material is then brought by wave action into the aërial zone. A certain amount of land rubbish is also transported from the materials of ordinary erosion on the continent and adjacent islands. The work is completed by the extension of the water-loving mangrove trees and the entanglement of land wash and organisms among their roots.

The Bermuda Islands afford a kindred case. Upon a substructure of some sort is built a cluster of islands whose visible rocks are exclusively limestone. The steps in the constructive process are: growth of organisms, especially corals; comminution and redistribution by the waves; eolian action upon beach sand raising the beds to a maximum height of a little more than 200 feet; the

* Geological History of the Laurentian Basin, in series of "Studies for Students," Jour. Geol., Vol. I, May–June, 1893, pp. 394–410.

† Elements of Geology, p. 160.

percolation of rain and sea water and consequent solution, cavern making, re-deposition and cementation; weathering and shore abrasion, giving rise to notable sea caves and lofty escarpments. So complicated are the forces which continually shape this island mass, although lithologically it is perfectly homogeneous.

Our principle is likewise well seen in the formation of atolls and barrier reefs. If we take Darwin's theory, we have the formation of the support of the coral mass chiefly by vulcanism, the growth of corals with wave and wind action as before, and continued subsidence, as the chief factors. If we take Murray's theory, we have, if possible, a longer list of conspiring causes. The submarine foundation may be one of accidental volcanic elevation to the required height, or a cone truncated by the waves, or a more deeply buried, primitive platform built up by the remains of pelagic organisms. Coral growth, wave and wind action, occur as usual, but with non-growth, and solution at the centre, in room of subsidence, to account for the lagoon. If, as held by some, both theories are true, each holding in certain cases, we find a still more complicated network of agencies, and a still better illustration of our principle.

The formation of coast islands is dependent upon several conditions. They may be constructive, built up as low, off-shore islands, where waves break and drop their load on a slowly descending marginal sea bottom. If wind and consequent wave action are powerful, tracts of the mainland may be insulated by the cutting away of surrounding areas. This is especially true of hard coast rocks bordered by those which are more yielding to mechanical agencies. If the land be undergoing a downward movement, headlands and any eminences adjoining the shore may be surrounded by the transgression of the waves. Insulation by surrounding erosion and by subsidence are likely to proceed together and to have joint efficiency in the production of the island form.

There can be no question of the importance of the considerations here set forth to the geographic investigator. This is true of students who set themselves to an exhaustive review of limited and familiar areas, and is no less true of explorers in fresh or remote fields. We cannot measure the degree to which reports of official explorations and private travel would have been enriched, during even the more recent decades, had the writers been, more often than they were, observers in this true and high sense.

Even more, if possible, may be said of the usefulness of such doctrines in geographic teaching. A recent pedagogical document

contains a reference to the land, the water and the air, as the "three dead geographic forms." The writer indeed used the expression in contrast with the biologic groups, but even thus it seems to me peculiarly unhappy and inappropriate, in view of that composite moulding, delicate balance and sensitiveness to change, which characterizes the forms with which geography deals. There can be no more profitable use, or effective stimulus, of the imaginative powers of a youth than the effort to realize vividly the growth of a geographic individual. More and more is this true as the student advances from one form to another, and finally becomes able to combine in panoramic review the elements of the complicated and progressive history of a region.* The teacher of Physiography has no greater reward than is his when a student assures him that henceforth his native State will be to him a new country, or that he shall see the hills and valleys of his old home with new eyes. This is precisely because he has learned to interpret the forms in the light of their origin, to read the work of the frost, the rain and the plant, to measure the achievement of the river, with perception of its past and prophecy of its future, or to see where the glacier has traced its unmistakable inscription. Every journey becomes fraught with meaning, and the traveller who has caught the spirit of modern geography will not report the great plains of Kansas and Nebraska as "uninteresting." It must, however, still be said that many colleges deny their graduates this appreciative eye. But even the secondary and earlier grades cannot much longer deprive their pupils of this best fruit of geographic study.

COLGATE UNIVERSITY,
January, 1895.

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* For the fullest expositions of geographic development in its pedagogic significance see several papers by Professor W. M. Davis, Geographical Illustrations or Suggestions for Teaching Physical Geography, Based on the Physical Features of Southern New England, Pub. by Harv. Univ.; The Improvement of Geographical Teaching, Nat. Geog. Mag., Vol. V, pp. 68–75; Physical Geography in the University, Jour. Geol., Vol. II, Jan.–Feb., 1894, pp. 66–100. Teachers may also consult with profit, Report of Conference on the Teaching of Geography, accompanying the Report of the Committee of Ten on Secondary School Studies, pub. by the U. S. Bureau of Education.

GEOGRAPHICAL NOTES.

BY

GEO. C. HURLBUT, *Librarian.*

THE FRANKLIN CELEBRATION.—It was on the 18th of May, 1845, that Sir John Franklin's Arctic expedition sailed from Greenhithe, never to return.

The fiftieth anniversary of this event was commemorated on the 20th of May, under the auspices of the Royal Geographical Society, by a visit to Greenwich, where the Franklin relics were inspected, and an evening meeting in the theatre of London University. At this meeting Mr. Clements R. Markham, the president, made an address, in which he reviewed the life and career of Franklin, the character of his officers and men, and the work done by his party, which practically discovered the North-West Passage. He spoke of the search expeditions, and recalled the generous action of Mr. Grinnell and the United States Government.

He was followed by Admiral Sir Leopold McClintock, who dwelt upon the lesson of Franklin's example and the admirable steadiness and discipline of his men, and closed with a reference to Lieut. Schwatka's* search for relics in King William's Land.

Including this, the last of all, the expeditions sent out to ascertain the fate of Franklin numbered 40, and it could have formed no part of Mr. Markham's design to present the list of them in his address. Something, however, he must have said as a tribute to the memory of that *hero of Arctic travel*,† Dr. John Rae, who brought back to England in 1854 the first discovered, and not the least precious, of those Arctic relics now preserved in Greenwich Hospital. To speak of a Franklin celebration is to remember, as Mr. Markham must have remembered, the foremost names on the long roll of the search expeditions, and those, who had not the good fortune to be present at the meeting in the theatre of London University, must regret the insufficiency of the reported proceedings.

* Lieut. Schwatka belonged, not to the navy, as the *Times* has it, but to the army of the United States.

† Obituary notice of Dr. Rae in the Geographical Journal, Vol. 2, p. 275.

SECOND ITALIAN GEOGRAPHICAL CONGRESS.—This Congress will meet in Rome in the latter part of September, 1895. There will be four Sections: the Scientific, embracing Mathematical Geography, Cartography and Physical Geography; the Economico-Commercial; the Didactic; and the Historical, comprising the History of Geography and of Cartography, and Historical Geography.

Membership is open to all on payment of the fee of Ten Lire to the Comitato Ordinatore, Via del Plebiscito, 102, Rome.

M. J. DE REY-PAILHADE, President of the Toulouse Geographical Society, will submit to the Sixth International Geographical Congress the question of the *simultaneous and parallel application of the decimal system to the measurement of time and of angles*, in order to obtain a greater rapidity in calculations with diminution of the chances of error.

The project bears a natural relation to Prof. Penck's proposed map of the world on a scale of $\frac{1}{1000000}$, and it forms the subject of a lucid report to the Toulouse Society by M. de Rey-Pailhade himself.

NORTH AMERICAN POLAR EXPEDITION.—The *Deutsche Rundschau für Geographie und Statistik*, for May, 1895, reports on the authority of a communication received by Prof. E. von Nordenskiöld in Stockholm, that an Arctic expedition is in preparation in North America, under the direction of the *State* Geological Survey, and that the cost of it will be borne by American capitalists, who have furnished for the purpose 500,000 dollars.

The object of the expedition is said to be the exploration of the hitherto unknown archipelago on the northern coast of North America, and, incidentally, of Ellesmere Land, where search has already been made for the lost Björling party. Prof. Dr. Robert Stein, of the Geological Survey, who planned two years ago but did not succeed in organizing, an exploration of Ellesmere Land and Grinnell Land, has requested the Canadian Arctic traveller Tyrrell to accept the command of the party charged with the search for the members of the Björling expedition.

This report has found its way into the *Scottish Geographical Magazine* for June (p. 315), and it seems proper to say that Mr. Robert Stein has no knowledge of the matter, and that the capitalists, who stand ready to advance half a million dollars, have so far escaped recognition.

TO THE POLE BY BALLOON.—Mr. Andrée, a Swedish engineer and skilful aeronaut, who wintered in Spitzbergen in 1882–83, has

laid before the Academy of Sciences at Stockholm a plan for reaching the North Pole by balloon, starting from the north-western point of Spitzbergen, where the coast is always free of ice by the middle of June.

Mr. Andrée's project has been carefully studied in all its details, and it meets with the entire approbation of Baron Nordenskiöld.

The balloon will be made to carry three persons, with provisions for four months and all the requisite instruments: the total weight not to exceed 3,000 kilogrammes (6,600 lbs.).

Safety buoys will be taken in the car to guard against accidents, and the double skin of the balloon will keep it inflated for a month at a time. In order to navigate the machine Mr. Andrée will use an apparatus which he has tested in several ascents. The balloon is provided with a sail, and from the car hang cables, which drag on the ground and retard the movement through the air. The sail can by this means be brought into play so as to deflect the progress of the machine twenty-seven degrees, and, in some cases, as much as forty degrees, from the direction of the wind.

The balloon will be inflated with hydrogen compressed in cylinders, and the filling will be accomplished inside of a high board fence.

It is on record that a balloon, set free in Paris on the night of November 25, 1870, arrived in Norway the next morning, and at this rate of speed the Pole would be reached in five or six hours from Spitzbergen.

The daily variation of temperature in the polar regions is very slight. At Spitzbergen, in July, the mercury occasionally falls to zero (Centigrade), and rises only a few degrees above it, and there is no fear of a storm.

Mr. Andrée will make his attempt in 1896.

EXPLORATION OF THE MACKENZIE.—M. C. de Lalande, Consul of France at San Francisco, in a letter of April 5, sends to the Paris Geographical Society, through the Ministry of Foreign Affairs, the manuscript itinerary of M. de Sainville's travels in the Mackenzie River basin in the years 1889–1894, accompanied by 29 photographic views of the country and a map of the route. (*Comptes Rendus de la Société de Géographie, Nos. 9 et 10.*)

MAZAMAS.*—This is the name of a society of mountain climbers, which was organized on the summit of Mount Hood, Oregon, on

* Apparently the Mexican name (plural) of the pronghorn (antilocapra americana).

the 19th of July, 1894. Its organization, we are told, was unique and successful, and this year the society aspires to convey, on the 10th day of July, a sunbeam message by means of heliographs from British Columbia to Mexico, and transmit an answer from Mexico to British Columbia.

The principal mountains in Oregon and Washington available for the purpose are Baker, Rainier, St. Helens, Adams, Hood, Jefferson, Three Sisters, Diamond Peak, Thielsen, Scott and Pitt, and in California Mt. Shasta, Tellac, Round Top, Dana, Lyell, Stillman, Whitney, Lome and Baldy. Sub-stations will be established along the line, and it is expected that each party will make arrangements for procuring photographic views of interesting points.

The main body of the society is to assemble at Mt. Adams, in Washington.

THE CLIMATE OF SAN DIEGO, CALIFORNIA.—The *American Meteorological Journal*, for May, publishes the following data on the climate of San Diego, compiled from the records of the Weather Bureau by Mr. W. L. Hearne, observer:

For the last 22 years the mean temperature has been: January, 57°; February, 55°; March, 57°; April, 57°; May, 62°; June, 65°; July, 68°; August, 70°; September, 68°; October, 63°; November, 57°; December, 57°.

The warmest months were: January, 1877, average 57°; February, 1876, 58°; March, 1885, 60°; April, 1885, 62°; May, 1885, 63°; June, 1885, 67°; July, 1891, 69°; August, 1885, 72°; September, 1889, 70°; October, 1875, 67°; November, 1890, 64°; December, 1890, 61°.

The coldest monthly averages were: January, 1892, 50°; February, 1882, 51°; March, 1880, 52°; April, 1872, 56°; May, 1875, 60°; June, 1873, 63°; July, 1880, 63°; August, 1880, 66°; September, 1880, 65°; October, 1886, 60°; November, 1886, 56°; December, 1891, 52°.

The greatest precipitation of rain in any month was 7.71 inches, in December, 1887. The greatest rainfall in 24 consecutive hours was 2.94 inches, January 12 and 13, 1892. No killing frost occurred in the twenty-two years. The greatest velocity of the wind was 39 miles an hour, recorded in April, 1877 (day not given).

The same journal, for June, has a paper by John D. Parker on California Electrical Storms, from which the following statements are taken:

One of the peculiar features of the weather of Southern California is the infrequency of electrical storms. In San Diego people do not protect their buildings against lightning, and the writer has been unable to discover a lightning rod in Los Angeles. The Weather Bureau has reported only two electrical storms at San Diego during the last sixteen years.

One of these storms occurred on August 27, 1894, and it may be taken as a type of all electrical storms in this region. On that day there prevailed a close, sultry atmosphere, with a stoppage of the sea-breeze, replaced by fitful currents of hot air from the desert, and a filmy vapor cast a slight veil over the face of the sun. About

midday the observer, at San Diego, from the roof of his building, saw far to the south fifteen or twenty very small thunder-heads, appearing conical above with flat bases. These thunder-heads moved slowly northward along the San Jacinto Mountain range, and arrived opposite San Diego about sunset, where, by the enlargement of the visual angle, they seemed to fill the whole heavens with black masses of cloud. The edge of this Sonora* brushed by San Diego that evening with an electrical display which was quite vivid in the mountains.

This storm brought to San Diego a warm shower of rain, which measured 4 inches. A bolt of lightning struck a wire in the city, and burnt out the coil of one of the dynamos in the engine-house, which extinguished for a brief period the incandescent lights all over the city.

THE BALTIC AND NORTH SEA CANAL.—Vice-Admiral Batsch contributes to *Globus*, for May, an account of the canal just opened between the North Sea and the Baltic, preceded by a historical sketch of the project.

The present canal is in a large measure due to the efforts of the Hamburg ship-owner Dahlström, who advocated it for years before it received the support of Prince Bismarck, and had the route surveyed at his own expense. It runs in a general north-easterly direction, from Brunsbüttel, at the mouth of the Elbe, to Rundsburg, where it joins and incorporates the old Eider Canal, and finds its termination at Holtenau, on the Bay of Kiel.

The act authorizing the construction was passed March 16, 1886, and an Imperial Canal Commission was appointed, with headquarters at Kiel.

A lock is built at each end to control the water-level, the tideless Baltic being five feet below the high-water mark of the lower Elbe; a difference of level which would give rise to currents in the 61 miles of the waterway. The canal has a width of 72 feet at the bottom and nearly 200 feet (60 metres) at the surface, with a depth of nearly 28 feet, and will admit the largest ships. The general level will be that of the harbour of Kiel, and the lock at the eastern end will remain open nearly all the time, there being only 25 days in the year when noticeable fluctuations occur.

The canal shortens the voyage from Kiel to Wilhelmshaven by 238 nautical miles.

Another writer† gives measurements strangely unlike those furnished by Vice-Admiral Batsch. Both make the length of the

* A local term, explained further on, where Mr. Parker says: "The thunder storms of this region are Sonoras, that move northward two or three times a year from Sonora and contiguous regions, where they originate."

† Civil-Engineer Joseph Riedel, in the *Deutsche Rundschau für Geographie und Statistik*, for May, 1895.

canal 98.65 kilometres (61.3 miles), and the width at the bottom 72 feet (22 metres), but in the *Deutsche Rundschau* the breadth at the surface is made 65 metres (213.26 feet), and the depth 9 metres (29.53 feet). The engineer or the admiral, or both, must be wrong; it were rash to choose between them.

That the passage may be left free to war-ships on occasion, waiting-stations for other vessels are established at intervals of 12 kilometres (7½ miles) Each of these stations has a length of 450 metres (1,476 feet), and a width, at the bottom, of 60 metres (197 feet).

The locks at the outlets have a clear breadth, between the gates, of 25 metres (82 feet), and a depth of 9.8 metres (32 feet), and will admit a ship 150 metres (492 feet) in length. The largest German ironclads measure 112 metres (367 feet) long by 22 metres (72 feet) broad, with a draught of 8 metres (26¼ feet). Although the great transatlantic steamers, 192 metres (630 feet) in length, are too large for the locks, they will be able to pass through the canal, for, while the gates on the Baltic are hardly closed during the year, those on the Elbe can be opened for three or four hours at the time of high-water.

Besides the shortening of the voyage from sea to sea, the advantages of the canal are: the development of commercial intercourse between the two coasts, and the saving in life and property by avoiding the dangerous navigation around the Skaw, the northern point of Denmark. The returns show that 35,000 vessels yearly pass through the Sound. In the period 1877–1881, 92 German vessels, with an aggregate tonnage of 20,000, and valued at between 3,000,000 and 4,000,000 marks, were totally lost in the passage, and 69 others went down at points not ascertained, while 708 persons perished. The number of vessels stranded on the Swedish and Danish coasts between 1858 and 1885 was 6,316, and of these 91 steamers and 2,742 sailing vessels were lost.

The yearly average losses by the voyage around the Skaw are 200 ships, with cargoes valued at 10,000,000 marks, and not less than 500 lives. The coast near Agger bears the significant name of the "Ships' Graveyard," or the "Iron Coast."

Dr. Reinhard Peck, Curator of the Museum, and for twenty-three years an Honorary Member of the *Naturforschende Gesellschaft*, of Görlitz, died in that city on the 28th of March, at the age of 72 years.

The Lisbon Royal Academy of Sciences announces the death

of its Secretary, Manoel Pinheiro Chagas, on the 8th of April, 1895.

THE TŌKYŌ SEISMOLOGICAL OBSERVATORY.—This observatory, created and for so many years directed by Mr. John Milne, was destroyed by fire on the 17th of February. The calamity is described by Prof. Milne in a letter prepared, as he says, *for maiden aunts and relatives*, and communicated to *Science* of April 19, by Prof. T. C. Mendenhall, a friend and fellow-worker of Mr. Milne's in Japan, in former years.

The losses are, for the most part, irreparable, and the public, including the maiden aunts, may well be surprised at the buoyant tone of the following account:

As nearly all the transactions of the Seismological Society were packed up to go to Europe, a few that had middle places in the boxes may be saved, but I doubt if even out of 2,500 copies I shall get more than two or three hundred. All my old earthquake books, some of which even dated from 1500 to 1600, but which were perhaps more curious than useful, seem to have gone. One function they had was to inspire the globe-trotter, or travelling clergyman, with respect for a science that was apparently so ancient. Amongst them there was a poem called "The Earthquake," A. D. 1750, but I know that by heart. The new books were volumes of bound pamphlets in all sorts of languages which I had slashed out of the publications of all sorts of societies. Perhaps the burning of them was a visitation for my Goth-like behaviour.

Instruments were fused or vaporized. Sixteen specially constructed clocks which would turn drums once a day, once a week, or drive a band of paper for two years, together with seismographs and horizontal pendulums, self-recording thermometers and barometers, microscopes, and a museum of old and new contrivances are now in the scrap heap. Until to-day, I felt I had the observatory I intended to put up in England completely furnished, and I was proud of the furniture. . . . . But what happened was the unexpected; the fire broke out in the midst of a pile of wood in an outhouse, and this, with a nice wind blowing, on a Sunday morning, when there was no one near to help. And now I have next to nothing—decorations, medals, diplomas, clothes, manuscripts, extending over twenty-five years, and everything else has gone up in smoke; still it is not altogether a misfortune. I shall not have a sale, nor the worry of selecting amongst my accumulations; there will be no buying boxes and packing up, neither will there be any haggling with custom house officials, or trouble in collecting on an insurance policy. On the other hand, I shall have new clothes, and some time or other, I hope, new clocks and new instruments, whilst what I have got is the knowledge that I have many sincere and kind friends. Their clothes don't fit, but the sympathy that they have expressed and the little things they have sent me tells me that I should never be homeless in Japan. Looked at in the right way, like an earthquake, a fire may, after all, be a blessing in disguise, but, of course, it is sometimes pretty well wrapped up.

"Dies iræ, dies illa,
Solvet sæclum in favilla."

Mr. Milne's address book was burned, and he asks all those to

whom Vol. IV of the *Seismological Journal* may be due to address him, care of *The Japan Mail Office*, Yokohama.

Out of the few hundred copies, more or less, of the Transactions of the Seismological Society of Japan, he will be able to make up some sets; and those desiring to obtain them should write to him, care of the Geological Society, Burlington House, London. He earnestly desires to receive, in exchange or otherwise, copies of any papers on or relating to earthquakes, volcanoes or earth movements in general.

Mr. E. von Rebeur-Paschwitz writes from Merseburg to *Nature*, of May 16, concerning some of Prof. Milne's late observations:

A few days ago I received from Prof. Milne a letter, dated March 15, 1895, in which he sends me a list of earthquake disturbances, compiled from the records he was fortunate enough to rescue from the fire which destroyed his house on February 17. In this list I find no less than three observations of the great Argentine earthquake of October 27, 1894, which was recorded by three different horizontal pendulums. The times given for the beginning of the earthquake—viz., 18 h. 0 m., 18 h. 5 m., 17 h. 41 m.*—are not very trustworthy . . . . . the error cannot exceed a few minutes. The duration of the disturbance was between two and three hours in all the three instruments. If we consider that the error of the first observation is not likely to exceed ten minutes, then we find . . . . that, although the spherical distance between the epicentre of the earthquake and Tokio is *no less than 17,400 kilometres* (10,812 miles), the earth-motion reached Japan at about the same time, or perhaps even a little earlier, than it arrived in Europe . . . . . Prof. Milne's observation is probably the first in which an earthquake was noticed by seismic instruments at a place so near the antipodes of the earthquake centre. A straight line between the two points is only very little shorter than the earth's diameter; the time required for the motion to pass through the globe was probably less than twenty minutes.

The same journal, of May 30, notes the occurrence of an earthquake, recorded at Tōkyō on the 18th of January, 1895, and registered by the seismometrograph of the Collegio Romano at Rome within 50 minutes; the distance being 9,500 kilometres (5,900 miles).

THE LUCHU ISLANDS.†—In a paper printed in the *Geographical Journal*, Vol. V, Nos. 4, 5 and 6, Prof. Basil Hall Chamberlain, of the Imperial University of Japan, describes the Luchu Islands and their people. Little known as they are, these islands possess a complex civilization, an ancient and checkered history, and a

* These hours are Japan time, *i. e.*, 9 h. east of Greenwich, and are reckoned from noon.

† The name is written in many ways. Mr. Chamberlain adheres to the forms *Loochoo* or *Luchu*, because they have been most generally employed by English writers and cartographers for nearly a century past.

language capable of throwing welcome light on Far-Eastern philology. They stretch from the south-western extremity of Japan to the north-eastern extremity of Formosa, the number of islands being 36, divided by Mr. Chamberlain into six groups, as follows:

1. The *North-Eastern*, of four islands. Of these Tane-ga-shima is admirably cultivated and contains a population of 23,000, and Yaku-no-shima, a circular island of 15 miles diameter, is covered with forests, and its mountains rise to a height of over 6,000 feet. Theft is unknown among the 8,800 people of this happy spot;

2. The *North-Western*, of three islands, Iwo-ga-shima, the most important, being rich in sulphur;

3. The *Shichi-to* (Seven Isles *), small and unimportant. Some of these islands are active volcanoes;

4. The *Oshima* group, eight in number. Of this group Oshima, 30 miles long by 17 wide in the broadest part, lies in the way of the *Kuroshiwo*, and has a very moist climate and a luxuriant vegetation. Four of the smaller islands produce considerable sugar;

5. The *Central Group*, or Luchu Proper. This has nine islands. Okinawa, or Great Luchu, is 56 miles long, with a breadth of from 2 to 14 miles. The northern part is rough and thinly peopled, but the central and southern parts are carefully cultivated, and support a dense population. The other islands, except Kume-jima, which is noted for a much-prized silk fabric, are without importance;

6. The *Saki-shima* Group, or Further Isles, contains four considerable islands and a number of islets, all inhabited.

One mountainous island, Iri-omote-jima, is covered with a dense forest. It has a bad climate, and malarial fever is endemic. According to the official census of December 31, 1891, Luchu Proper and the Further Isles contain 82,477 houses, with a population of 410,881. Of the population 95,000 are classified as nobility and gentry, and 235,000 as common people.

Some of the islands are volcanic; others, such as Great Luchu, of coral formation. The Further Isles, though surrounded by coral reefs which make navigation perilous, are in part of volcanic origin.

The cattle and horses are small, as are the deer and the wild pigs. The monkey, so common in Japan, is unknown. A poisonous snake, the *habu*, abounds in Oshima and Toku-no-shima. It is four or five feet long and two inches in diameter. It enters the

* There are really eight, Mr. Chamberlain says, in spite of the name.

houses and springs out at passers-by from the hedges, and, within recent years, it so infested one village that the inhabitants abandoned their houses.

The flora diverges widely from that of Japan. The bamboo is rare; there are several palms, many ferns and tree-ferns, and an enormous number of cycades, which furnish a kind of sago. The cultivated plants are sugar-cane, sweet potatoes, tobacco, indigo, pumpkins and gourds, Indian corn, beans, cereals, radishes and the like. Every suitable spot of land, even to the brink of the sea, is laid out in rice-fields.

Speaking broadly, the winter is the dry season, the late spring and summer the wet one, and the climate is salubrious in most of the islands. All the Luchus are swept by the dreaded typhoons.

Mr. Chamberlain notes the curious fact that in the Japanese archipelago the vegetation diminishes in rankness as one travels from the north to the south. In Yezo the grasses are higher than a man on horseback; in Central Japan they rise to the height of a man, and in Great Luchu there are no tall grasses, and very few thickets.

The history of the islands, as told by Mr. Chamberlain from the study of the records, has little interest. The political arrangements, he remarks, seem to partake of an *opéra comique* character, with public offices and officers almost without end, until we begin to wonder whether there is any population left to govern. None the less, he affirms that there has been progress:

> For the general assertion may safely be hazarded that Oriental stagnation exists only in Occidental fancy.

Perhaps so, in a sense; but there can be no agreement without an accepted definition of terms. What is stagnation and what is fancy? The most prominent race characteristic of the Luchuans is a moral one. They are marked by gentleness of spirit and manner, by a yielding and submissive disposition, by hospitality and kindness, and by aversion to violence and crime. Mr. Chamberlain's experience in 1894 agrees with that of every visitor to the islands except Perry, who, possibly, did not see things as they were.

MANCHURIA.—The Rev. John Ross, D.D., who has known Manchuria for twenty-two years, describes it in an interesting paper, printed in the *Scottish Geographical Magazine*, for May.

The country is a great plain, lying between the port of New-Chwang, on the south, and the Amur River, on the north-east. On

the west the plain is bounded by the hills of Mongolia, and on the east by low mountain ranges. The highest mountain of Manchuria is the "Ever White Mountain" in the extreme north-east, so called from the appearance of its upper ridges, which are composed of pumice, and, according to Mr. Younghusband's measurement in 1886, not more than 8,000 feet in altitude.

Earthquakes are rare and slight, but there is every indication that they were severe in remote ages, and the signs of volcanic activity abound. Not far from Ninguta there is an extensive field of lava, which sounds hollow to the tread. The most common rocks are basalt and granite, quartz and quartzite, and a coarse white marble.

The centre of the water-shed is the Ever White Mountain, and from it flow the Usuri, the Sungari, the Yalu, which bears immense rafts of timber, pine, oak and walnut, to New-Chwang, which also receives by the Liao River the vast quantities of grain accumulated every autumn in the north.

The soil of Manchuria seems to be a mixture of two-thirds clay and one-third sand. In winter and in dry weather it cracks in all directions. It is extremely fertile, and produces full crops year after year without manuring.

Baron Richthofen's theory that this soil is formed by dust-storms is not accepted by Mr. Ross, who finds the origin of the *loess* in the disintegration of the granite and the pulverization of the basalt. The process of transformation may be seen on the line of hills skirting the great plain.

There are four and a half months of summer, five of winter, one of spring and one and a half of autumn. The winter ends with March, April is the spring month, and summer begins with May.

The rains are light till the end of July, when they become heavy and long-continued and flood the country. September is the harvest month, and nothing can be finer than the October weather—dry and clear and mildly warm. The winter comes in November; the ice forms three or four feet thick, and the ground is frozen to the same depth. The greatest cold is usually 17 degrees below zero (Fahr.), though it sometimes sinks to 27 at Mukden, and at Kirin to 40 degrees below zero. Even in midwinter the sun is so hot that it is unpleasant to sit against a window with a southern exposure. The greatest heat is 100 degrees in the shade.

The minerals are gold, silver, copper, coal, and excellent iron.

The principal crop is "tall" millet, or *sorghum*, the chief

food of the people. It produces eight hundred-fold. The "small" millet, like birdseed, is said to produce ten times as much.

Besides these, the people cultivate barley, wheat, beans, Indian corn, tobacco, opium, indigo, jute, hemp, and the castor-oil plant, kitchen vegetables and many roots. The fruits are grapes, plums, apricots and peaches. Game and fish abound.

The most important industries are those of the furrier and tanner. Mr. Ross thinks that there are probably more furs cured in Mukden than in any other city of the world.

The population can hardly be less than 25,000,000. Mukden, the capital, has 300,000, and there are many large cities and towns and on the great plain villages and hamlets are planted so thickly that one is hardly left behind before another is entered. Mr. Ross found, by making a careful list of the villages within a radius of 3½ miles, a population of 100,000, living wholly by agriculture. A steady stream of immigration from Northern China has poured into Manchuria for two hundred years, and at least three-fourths of the people are pure Chinese, and the Chinese language is universal.

The peasantry live on their own small properties. Food, fuel and clothing are abundant, and the taxation is probably the lightest in the world.

THE MAP OF AFRICA.—Lieut.-Gen. E. F. Chapman, F.R.G.S., makes, in a letter to Mr. Markham, President of the Royal Geographical Society, some excellent suggestions with regard to the mapping of Africa. He recognizes the good work which has been done in South Africa, in Algeria and Tunisia, and in East Africa, and he quotes the following passage from the report of the Surveyor-General, British Bechuanaland, for the year 1890–91:

> From a practical point of view the value of this work can hardly be over-rated; in many countries erroneous surveys are one of the most fruitful sources of litigation and waste of money in connection with disputed land boundaries, necessitating very often the enormous expense of subsequent geodetic triangulations and re-surveys of land grants. The Imperial Government has conferred a great boon on this territory by authorizing a geodetic triangulation as the basis of all future survey operations. . . . We are indebted for the great practical advantages we are already reaping from this work, viz., the correct and uniform data supplied to our surveyors, which enables them to do their work in a satisfactory manner, and the great facility and accuracy with which in this office we are enabled to lay down on the map of the country the results of every survey which has been connected with the trigonometrical piles.

In conclusion, he invites the attention of geographical societies

and the International Geographical Congress of 1895 to these subjects:

(1.) The advantages to be gained from an economic as well as from a scientific point of view of extending geodetic surveys in the settled portions of Africa.

(2.) The importance, in districts beyond the probable range of geodetic surveys for the next few years, of making surveys of areas rather than of routes; and the advisability of basing such surveys on rapid theodolite triangulations, wherever it is practicable to do so.

(3.) The desirability of collecting a complete record, as regards Africa, of all the positions that have been accurately fixed astronomically in areas that have not been triangulated, and of combining measures for the purpose of determining new positions, taking care that, in the case of all future observations, full data should be published so as to enable the geographical world to appraise them at their proper value.

(4.) The advantages to geodetical science of trigonometrically connecting the triangulation of India with that of Europe by joining it on to the Russian triangulation of Trans-Caucasia.

THE WEBI SHEBELI.—Dr. Donaldson Smith, in a letter addressed to the Royal Geographical Society, under date of December 14, 1894, writes:

. . . . The river which forms the principal source of the Webi Shebeli, and which I shall call after myself, winds south as it passes in front of Mount Abougassim . . . . A large tributary of the Jub River had carved its way through a hill for one mile, as it curved south-east through a deep canyon. This stream is called the "Web," and the river Smith is called the "Wabi" by the natives; but the names are often confused, so I have named the "Web" River Gillett, and the caves I have marked on my map as the Caves of Wyndlawn.*

Dr. Smith does not profess to have discovered these rivers, and the unusual names which he chooses to bestow upon them can have no significance for other men.

The *Bollettino* of the Italian Geographical Society (Fasc. III and V, 1895) protests against the abuse, in this instance, of the explorer's supposed right, and the *Geographical Journal* remarks that if a European name is to be given to the Webi Shebeli, it is surely that of Haines.†

It may be assumed that the rivers will continue to be known as the Webi Shebeli and the Web, since, if there is no authority to forbid the giving of unnecessary names, there is none to compel the recognition of them, when given.

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* Geographical Journal, Vol. V, No. 2, p. 126.

† . . . . It was Lieutenant Christopher who first reached its lower course in 1843, and who named it after his distinguished superior, Captain Haines of the Indian Navy (Geog. Jour., Vol. V, No. 5, p. 485).

REPORTED DEATH OF E. J. GLAVE.—The following telegram appeared in a New York paper of June 18:

LONDON, June 17.—E. J. Glave, the explorer, who had just travelled from Zanzibar to the Congo for the hundredth time, died recently at the mission station in Underhill, near Matadi, on the Congo. A memorial was erected a mile from the grave.

Although but 32 years of age, Mr. Glave had done much good work in the exploration of Central Africa. He began his career under Stanley, who says of him:

Mr. E. J. Glave . . . . is one of those young Englishmen who, in 1883, were sent to me for service on the Congo, by the Chief of the Bureau of the International Association of Brussels. I soon recognized in Mr. Glave those qualities for which I was eagerly searching. . . . He was tall, strong, and of vigorous constitution, with a face marked by earnestness and resolve. . . . I was in need of a chief for a new station that was to be built at Lukolela—a place about three hundred miles above the Pool, and I selected him.

On reaching the locality I pointed out to Mr. Glave the site of the future station, and certainly nothing could be more unpromising and more calculated to damp mere effervescent ardor than the compact area of black forest—raising its tall head two hundred feet above the bank—and shadowing so darkly the river's margin—but Mr. Glave regarded it with interest, and a smile of content, and accepted the responsibilities then and there entrusted to him with a pleasure not to be suppressed. We landed and made fast . . . turned to and commenced to chop the forest giants down . . . I was absent for a few months up river. . . . . But when I came opposite Lukolela Woods I curiously examined the extent of tree-clad bank, and long before we came to the landing-place we found that the clearing had been vastly increased, and a large sunny area was revealed, and a commodious house flanked by rows of neat huts was approaching completion. . . . . I always regarded Mr. Glave as one who in the future would probably surpass his opportunities. . . . His conscientiousness, his inflexible determination to do the most that can be done in a given period, the love with which he sets about it, and the absorbing interest it has for him, make me, who knew his worth, feel sorry that he cannot find the peculiar hard task for which he is so fitted. . . . . (Introduction to *In Savage Africa*, by E. J. Glave, New York, 1892.)

The qualities of the youth remained with the man, and all who knew Mr. Glave felt an attachment to him. With all his strength of character he was modest and gentle, and he exercised a remarkable influence over the wild men with whom he lived, whether in Africa or in Alaska. It was his hope to do effective work in breaking up the African slave-trade, though he made no profession of the task to which he had devoted himself in singleness of heart.

His untimely death frustrates a worthy ambition.

THE ROYAL GEOGRAPHICAL SOCIETY OF VICTORIA held an open-air session at Mr. J. W. Lindt's Hermitage on the Black Spur, near Marysville, on the 9th of March, in honour of its president,

Baron Ferdinand von Mueller. The Hermitage stands in the middle of a primeval forest, above the valley of the Acheron; a name hardly suggestive of picnics.

A paper by Mr. Lindt described his adventures in an open whaleboat among the islands of the New Hebrides group. The Rev. W. Potter advocated the cause of Antarctic exploration. Baron von Mueller returned thanks for the compliment paid to him, and called attention to the fact that the geographical map of Australia, which, it had been expected, would be completed before the expiration of the present century, was not yet begun; but he still hoped.

WASHINGTON LETTER.

WASHINGTON, JUNE 20, 1895.

The first Government exploration of the mineral fields of Alaska is authorized by an act of the last Congress which appropriated $5,000 "for an investigation of the coal and gold resources of Alaska," to be expended under the direction of the Geological Survey. Prof. George F. Becker (mining expert), Prof. W. H. Dall (Alaska expert), and C. W. Purrington (assistant to Prof. Becker), are already at Sitka, from whence they will go to Kadiak Islands, Cook Inlet, and possibly as far west as Shumagin. They are expected to make a practical study of the economic geology of the Territory. The most productive gold mines in this Territory are located on a belt or zone beginning at Mexico, and running from southeast to northwest, in almost a straight line, to the Arctic Ocean. On this belt, which varies in width from two to twenty miles, are the mines about Juneau, Berner's Bay, Gold Creek, and the placer mines of the Yukon Valley, Forty Mile and Miller creeks.

Prof. Becker has completed his investigations of the gold-producing districts of the southern Appalachian region, on which he has been engaged since last August. He considers this oldest gold-producing region of the country a good mineral one, and the prospects for investment excellent for moderate returns—say 10 to 15 per cent. There are not likely to be any great fortunes made, nor any bonanzas discovered. The gold region is best defined in the Carolinas and Georgia, especially in the southwestern part of North Carolina.

GEOLOGIC MAPS.—As has been already stated in the BULLETIN, the plan adopted for the geologic map contemplates the division of the entire area of the United States into small rectangular districts, bounded by certain meridians and parallels. The maps and descriptions of each rectangular district are issued in folio form. Each folio is designated by the name of the principal town or of a prominent natural feature within the district. It contains topographic, geologic, economic, and structural maps of the area, together with explanations and descriptions. When all the folios are completed they will constitute a geologic atlas of the United States.

The folios now ready for distribution are the following:

NO.	NAME OF SHEET.	STATE.	LIMITING MERIDIANS.	LIMITING PARALLELS.
1	Livingston	Montana	110°–111°	45°–46°
2	Ringgold	Georgia, Tennessee	85°–85°30′	34°30′–35°
3	Placerville	California	120°30′–121°	38°30′–39°
4	Kingston	Tennessee	84°30′–85°	35°30′–36°
5	Sacramento	California	121°–121°30′	38°30′–39°
6	Chattanooga	Tennessee	85°–85°30′	35°–35°30′
7	Pike's Peak	Colorado	105°–105°30′	38°30′–39°
8	Sewanee	Tennessee	85°30′–86°	35°–35°30′
9	Anthracite-Crested Butte	Colorado	106°45′–107°15′	38°45′–39°
10	Harper's Ferry	Virginia, West Virginia, Maryland	77°30′–78°	39°–39°30′
11	Jackson	California	120°30′–121°	38°–38°30′
12	Estillville	Virginia, Kentucky, Tennessee	82°30′–83°	36°30′–37°
13	Fredericksburg	Maryland, Virginia	77°–77°30′	38°–38°30′
14	Staunton	Virginia	79°	38°

At the uniform price of 25 cents for each folio.

The methods and results of the primary triangulation executed by the United States Geological Survey during the past twelve years, that is to say, since the commencement of work upon the topographic atlas, are stated by Mr. Henry Gannett with great minuteness in a recent Bulletin of the Survey (No. 122). The results have been arranged in chapters by geographical groups, such as New England, New York and Pennsylvania, Southern Appalachian region, etc. Something over one thousand stations are located and described. In explanation of methods, Mr. Gannett says that wherever work has been done by other organizations, which is of sufficient accuracy for the control of the maps of the Geological Survey, such work has been utilized. The work of the Coast and Geodetic Survey, of the Lake Survey, of the New York State Survey has been extensively used. In the interior of the country and in the Far West, the work has been done *ab initio;* but the triangulation executed by early surveys in the West, known as the Hayden, Powell and Wheeler surveys, has been utilized to some extent for the control or initiation of work; that of the Wheeler but little, that of the Hayden to a greater extent, especially in Colorado. That of the Powell Survey, the results of which have never heretofore been published, has been used very largely. The seventeen maps accom-

panying this work describe graphically the triangulations already secured.

Mr. Gannett has in press a Dictionary of Geographic Positions.

TOPOGRAPHIC MAPS.—Under a provision of the Sundry Civil Service Act for 1895–'96, which goes into operation July 1, 1895, the Director of the Geological Survey is authorized to sell copies of topographical maps of the United States now in course of construction, with text, at cost, and ten per cent. added. The Director (Mr. Charles D. Walcott) has the plan of issuing these maps under consideration. The proposition is to issue ten maps at one time, with descriptive text, as a folio. These maps will illustrate ten distinct phases of topography that occur within the area of the United States. Subsequent folios will each contain ten maps, illustrating some particular type of topography, as that of the Appalachian Mountain system, that of the Atlantic Coastal Plain region, etc. The cost of these folios will probably not exceed 25 cents. The extent to which the plan will be carried has not yet been fully determined.

The following topographic atlas sheets have been engraved and printed since January 1, 1895:

New York: Mount Marcy.
Ontario Beach.
Rochester.
Plattsburg.
Mooers.
Rouse Point.
Syracuse.
Chittenango.
Oneida.
Oriskany.
Watertown.
Pulaski.
Sacketts Harbor.
Stony Island.
Cape Vincent.
Ausable.

New York: Willsboro.
Cambridge.
Ithaca.
Elmira.
Catskill.
Rhinebeck.
New Hampshire: Crawford Notch.
Washington: Seattle.
Oklahoma: Kingfisher.
Virginia—West Virginia:
Tazewell.
North Dakota: Savo.
Nebraska: Grand Island.
Wood River.
Colorado: Cripple Creek.
Florida: Citra.

Hereafter the report on the Mineral Resources of the United States will be issued as a part of the report of the Director of the Geological Survey, and printed as soon as completed. Separate chapters on any given mineral product will be printed as rapidly as transmitted for publication. The accompanying papers of the Director's annual report, that are of a strictly economic character, will also be issued in pamphlet form.

Congress, at its last session, directed that one copy of each monograph, bulletin or report of the Geological Survey printed prior to the year 1894 should be sent to two public libraries, to be designated by each Senator, Representative and Delegate; such public libraries to be additional to those to which said publications are distributed under existing laws.

A work soon to be issued by the Geological Survey is The Glacial Lake Agassiz, by Warren Upham.

Mr. C. D. Perrine, in a recent Bulletin of the Survey (No. 129), describes the earthquakes in California, in 1894.

In providing for a survey of the Indian Territory, Congress at its last session departed from a long usage, viz., the survey of public lands by U. S. Surveyors-General under the General Land Office, and in this case—the first instance of the kind—authorized the Secretary of the Interior to have the new survey of this Territory made under the direction of the Geological Survey. The Director has already sent parties to the field. Work has been commenced on the Chickasaw lands, and will be carried westward therefrom. It is expected that this portion will be completed by the close of the year, or at least by next spring. The enactment of Congress provides that when any surveys have been made and plats and field notes thereof prepared, they shall be approved and certified to by the Director of the Geological Survey, and that such surveys, field notes and plats shall have the same legal effect and force as heretofore given to the acts of the Surveyors-General.

The United States Board on Geographic names, which it will be remembered was created five years ago by an Executive order, held its 42d meeting recently and adjourned until September next. More than twenty-five hundred cases of disputed names have been decided.

The prominent departures from old methods of speaking which have been approved by the Board, and therefore become binding on all Government officials, are these: Dropping the final "h" in the termination "burgh"; abbreviation of "borough" to "boro"; the spelling of "center" (not like "centre"); the discontinuance of the use of the hyphen in connecting parts of names; the omission of "C. H." after the names of county seats; simplification of names consisting of more than one word by their combination into one word; the avoidance of the use of diacritic characters; the avoidance of the use of the possessive form of names, and the dropping of the words "city" and "town" as parts of names.

The Hydrographic Office, in recent issues of *Notices to Mariners*,

furnishes a large amount of new information concerning Alaska. A Coast Survey chart of Cook Inlet (1886) is reproduced, with additions in 1894 by Lieut. J. B. Collins, of the *U. S. S. Mohican.* Lieut. Collins describes with minuteness the coast, the villages, mountains, volcanoes and adjacent islands of this great inlet, from Chugatz Islands to Kamishak Bay. At Redoubt Bay there is a well-marked glacier.

In the same publication Lieut. G. A. Merriam, of the *U. S. S. Concord*, has new descriptions of several islands in the Aleutian group; making important corrections in geographical positions and areas, as in the case of Unalaska Island. Concerning Bogoslof Islands he says: "The proximity of Bogoslof Islands, while hidden in dense fog, was detected when several miles to leeward of them by a smell of sulphur and guano. The birds in this vicinity are numerous. It is reported that Bogoslof is now only one-third of its original height. The water was disturbed on the eastern side of the northern island, and smoke and steam were visible." He says that Yunaska Island is charted about four or five miles northward and westward of its true position. The Islands of Four Mountains of this group are incorrectly shown on the chart in number, grouping and positions. The *Concord* found two islands, both volcano peaks, and not charted, off the west end of Chuginadak, separated by deep channels from the latter and from one another. There is no island westward of Kagamil Island where Kigalgin Island is shown on the charts.

The *Notice* of February 16 contains a new chart of the northwest coast of Umnak Island from an exploration in 1894 by Lieut. E. F. Leiper, U. S. N., of the *Concord.* The issue of February 23d has a chart of the Islands of Four Mountains, from explorations by the same officer.

The Hydrographic Office announces that numerous reports have been received from United States vessels, to the effect that the Semidi Islands are incorrectly charted; and the same as to Cape St. Elias, Cape Suckling and Cape Hinchinbrook and Montague Island.

Concerning the latter island Lieut. Collins makes an interesting statement in *Notices* of February 23d, and in the same issue he gives some general information about the south coast of Alaska peninsula from Kupreanof Point to Cape Pankof.

The same Office has issued a supplement to the Sailing Directory for Bering Sea and the coast of Alaska (edition of 1869), bringing data to the present time. This is the latest and best geography of the region from Point Manley, Yakutat Bay to the Semidi Islands,

including Prince William Sound, Cook Inlet, and the Kadiak, Afognak and Trinity group of islands.

In this connection may be noticed also the third Supplement to the Sailing Directory for Newfoundland and Labrador (edition of 1884); and the third Supplement to the Sailing Directory for the Caribbean Sea and Gulf of Mexico (edition of 1890). These volumes contain not merely sailing directions, but the latest geographic investigations and discoveries made by American and foreign navigators.

The Hydrographic Office gives notice that it desires to connect itself with the nautical practice of the Great Lakes. In pursuance of this object it will place within the reach of mariners of the lakes much useful nautical information that cannot be profitably collected and published by private individuals. Some of its publications are circulated among mariners without charge, but in the nature of an exchange, it being presumed that mariners will co-operate with the Office in collecting information for the general benefit. Branch offices, where useful information and the publications of the Office may be procured, have been established at several prominent points on the lakes.

In pursuance of this object the Office commenced March 15th the monthly publication of *Notices to Mariners for the Great Lakes*, occupying a field corresponding to the long and well known *Notices to Mariners* (of seas, etc.). It is in the interests of the immense and rapidly growing lake commerce. Over thirteen millions of registered tonnage passed through St. Mary's Ship Canal alone last season. Steamships quite equal to many of the Atlantic liners will soon carry freight from Chicago direct to European ports, *via* the enlarged Welland Canal. The Hydrographic catalogue of maps includes one hundred and twenty charts of the great water-way from Lake Superior to the Atlantic.

This Office also has in preparation a series of sailing directions for the Great Lakes. There have been published three volumes, covering (1) Lake Superior, including St. Mary's River and Straits of Mackinac; (2) Lake Michigan, including Green Bay and Straits of Mackinac; (3) Lake Huron, including St. Clair and Detroit rivers, and Lake St. Clair. These volumes will be followed by (4) Lakes Erie and Ontario, including the St. Lawrence River to Montreal. At this point connection is made with Hydrographic Publication No. 100, published in 1891, which covers the Gulf and River St. Lawrence, etc.; thus giving complete sailing directions from Duluth to the Atlantic.

These volumes have geographic value also, because they describe the latest developments of the regions traversed.

For the last ten years Mr. George W. Littlehales of the United States Hydrographic Office has been engaged in collecting observations with a view of providing for the deduction of values of the rates of secular change of the variation of the compass for use on the nautical charts of the regions in which the stations are situated. He presents his discussion of part of the observations in a ittle volume recently published by the Hydrographic Office, entitledl *Contributions to Terrestrial Magnetism, the Variation of the Compass.*

The observations have been made at fifty-one of the principal maritime stations of the world since the year 1589, the outranking ones being the Azores (Fayal), Batavia (Java), Cape of Good Hope, Nossi Bé, St. Helena, Aden, and St. Vincent (Cape Verde Islands).

There are also recorded in a form for discussion 1,953 observations at 920 other important maritime stations which he proposes to investigate as soon as the collection of data have become sufficient.

Mr. Littlehales says: "The results as presented also give values of the variation throughout the range of observation, and for the years 1895, 1900 and 1905, and provide the means for readily deducing the value of the variation for any past year not greatly beyond the range of observation, and also for predicting, within an assigned measure of precision, values for the years up to 1910, for the purpose of stating the correct direction of the magnetic meridian on the charts."

By an act of the last Congress, the States west of the Mississippi containing arid or desert public lands are entitled to receive from the Government, free of cost of survey or price, not to exceed one million acres of such land in any one State, on the proviso that any State making application for the same shall cause such land to be irrigated and reclaimed on such plans as the Secretary of the Interior shall approve.

The States affected by this legislation are California, Montana, Idaho, Wyoming, North and South Dakota, Nevada, Utah, Colorado and Kansas, if the latter has any land still open to settlement that can be called arid. The object of the enactment is declared to be "to aid the public land States in the reclamation of the desert lands therein, and the settlement, cultivation and sale thereof in small tracts to actual settlers"; that is to say, in quarter sections to citizens who shall settle on them.

Before the application of any State is allowed or any segregation of land from the public domain ordered, the State must file a map of

the land proposed to be irrigated, which shall exhibit a plan showing the mode of the contemplated irrigation. But the State shall not be authorized to lease any of the lands or to use or dispose of the same except to secure their reclamation, cultivation and settlement.

It is reported that the Government of Great Britain has selected Fanning Island, located 1,200 miles southward of the Hawaiian group, as a mid-ocean landing for a Pacific cable; the effort to secure a landing on Necker Island having failed on account of a treaty arrangement between the United States and Hawaii which prevented such concession. Fanning Island, over which Great Britain raised her flag in 1888, was discovered by an American ship in 1798. It is ten miles long, four miles wide, of an oval shape, and incloses an harbor.

The line projected is from Victoria, B. C., to Australia. From Victoria to Fanning Island the distance is 3,860 miles, and to Australia, 7,000 miles. The estimated cost is about $1,000 per mile.

Meanwhile, Mr. A. J. Coote, an Australian who is interested in different cables, is reported to be on his way to Washington with a proposition to lay a line from Monterey to Honolulu. He is said to represent a French company which is willing to build from Sydney to San Francisco, taking in Auckland, Samoa and Honolulu.

The Canadian Government is informed that the Hawaiian Government has made important concessions to Huddarts' Australian Steamship Line, by which the company, in consideration of carrying all Hawaiian mails without charge, and of holding the present schedule of passenger and freight rates, is given freedom from all charges at the port of Honolulu, except pilotage and water, and free use of land for the storage of coal for its vessels.

Attention was called in the last issue of the BULLETIN to Mr. Rockhill's "Diary of a Journey through Mongolia and Tibet in 1891 and 1892." There has recently appeared from the pen of the same writer, "Notes on the Ethnology of Tibet," published as an extract or "separate" from the Report of the U. S. National Museum for 1893. The work is based upon the Tibetan Ethnological collection in the Museum, which is liberally drawn upon for well-chosen illustrations.

After defining the origin of the word "Tibet," the writer describes the geographical position of the country. It forms an integral portion of the Chinese Empire; is an elevated plateau, and one of the best defined natural regions in the world. These natural

divisions are three,—according to the altitude of the country above the sea level and the trend of the valleys:

(1) The northern plateau, with an average altitude of 15,000 feet. (2) Valleys parallel to the southern edge of the northern plateau, which nowhere descend below an altitude of 10,000 feet. (3) Valleys trending approximately north and south in the eastern portion of the country, and which descend to an altitude of 6,000 feet above sea level.

He narrates the history of its civilization derived from Tibetan and Chinese sources, and concludes that the present civilization and rather advanced degree of culture is entirely borrowed from China, India and possibly Turkestan, and that Tibet has contributed only the simple arts of the tent-dwelling herdsmen.

The general appearance of the people, and their physical characteristics are well described, and the author remarks that: "Intercourse with these people, extending over six years, leads me to believe that the Tibetan is kind-hearted, affectionate, and law-abiding, and that many of the most objectionable features in his character only appear in his intercourse with foreigners with whom he has had hardly any relations, and whom he instinctively fears and mistrusts, in view of the open hostility shown them by the official class throughout the country."

He speaks cautiously of society organization. As to consanguineal conditions he say: "The looseness of the marriage relations, the difficulty of identifying people who are only known by surnames, together with the habit of never using a person's name when addressing him or her, and the very marked disinclination of this people to speaking of their families or family affairs, make researches on this subject extremely difficult. The fact that throughout Tibet not only polyandry but also polygamy obtains, adds wonderfully to the confusion in which the question of consanguineal organization is involved." A table contains eighteen names of the various degrees of relationship,—all that he was able to note. The women attend to bartering, and keep nearly all the shops. Property is inherited by sons or brothers; daughters or wives get nothing.

The present coinage of Tibet has been in use since the middle of the 18th century. It comprises only one coin, a silver one of the nominal value of about 16 cents. Fractional money is made by cutting this coin into pieces, but in most parts of the country money is little used, the people bartering for many of the things they require. H.

Actual Africa; or, The Coming Continent. A Tour of Exploration. By Frank Vincent. With Map and over One Hundred Illustrations. 8vo. New York, D. Appleton & Co., 1895.

With this volume of 500 pages, Mr. Vincent brings to a close the work of twenty-five years dedicated to a full and systematic tour of the globe. Fifteen of these years were spent in actual travel, as follows: One in the great islands and archipelagoes; two in the United States and British America; three in Europe; three in Asia; three in Central and South America; and three in Africa.

It is needless to add that Mr. Vincent travelled for the love of it, that he was interested in all the sights he saw, and that his book is a record of real and vivid impressions. He tells his story in an unaffected way, and he treats his reader with respect.

The illustrations are nearly all good.

Distribution of the Magnetic Declination in Alaska and Adjacent Waters for the year 1895, with one Chart. A report by C. A. Schott, Assistant (U. S. Coast and Geodetic Survey, Bulletin No. 34.) 8vo. Washington, 1895.

Up to the year 1892 it was believed that in south-eastern Alaska, and even as far south as the State of Washington, the direction of the magnetic needle was either stationary, or moving slightly to the westward; but observations made since that time at Sitka and Fort Wrangell, at Seattle and Tacoma, and the discussion of observations made at Esquimalt, Vancouver Island, between the years 1858 and 1892, establish the fact of an increasing easterly declination for those points and the adjacent regions. The observations of 1889 and 1890 at Fort Yukon, in the interior, showed a declination decreasing by a few minutes per annum, in accord with the easterly decline along the shores of Bering Sea and the Arctic Ocean.

The chart exhibits the isogonic curves for 1895, constructed by the analytical method.

Die Länder des Islám nach Chinesischen Quellen, von Prof. Dr. Friedrich Hirth. 1. (Supplément au Volume V du "T'oung-Pao.") 8vo. Leiden, 1894.

This first part of Dr. Hirth's work has had the advantage of revision and annotation by Dr. M. J. de Goeje, the distinguished

professor of Arabic in the University of Leyden. The paper was written at Shunking, on the upper Yangtse-Kiang, not many hundred miles from the frontier of Tibet, and without the help of much-needed books of reference on Arabic matters.

Dr. Hirth's argument is that the Chinese notices of the Mohammedan countries are as correct and copious and, when rightly taken, as intelligible as the Arabic accounts of China. He goes even further when he asserts that, notwithstanding all that has been accomplished by Yule for the elucidation of Marco Polo, the best yet remains to be done. We shall have to take his word for it, and continue to believe in Sir Henry until we see the better work.

The Chinese author of the 14th century, translated by Dr. Hirth, gives the following description of Mecca:

> The land of Mecca is reached after 80 days' journey westward from Ma-lo-pa (Arab capital city, not identified). This is the place where the Buddha *Ma-hsia-wu* (Mohammed) was born. In the Buddha's house (the Kaaba) the mason-work is of jade, of all colours. Every year, when the death-day of the Buddha comes, the people gather here from all the lands of the *Ta-shih* (Arabs) to do him reverence, and on this occasion they emulate each other in bringing presents of gold, silver, jewels and precious stones; the house also is then newly covered with silk brocade. Farther inland (in Medina?) is found the Buddha's grave. There shines continually, by day and by night, a halo so bright that no one can approach it; whoever passes by shuts his eyes. It is said that he, who in his dying hour rubs his breast with earth taken from this grave, will be born again through the power of the Buddha.

Meteorology, Weather, and Methods of Forecasting, Description of Meteorological Instruments and River Flood Predictions in the United States, by Thomas Russell, U. S. Assistant Engineer. 8vo. New York and London, 1895.

Mr. Russell's preface is pessimistic. He says:

> The hopes that were once entertained that a precise knowledge of coming weather could be gained from the weather-map has (have) not been fully realized. Cases are comparatively rare where it can be of use in predicting the weather. There are not more than six to twelve occasions in the course of a year for any part of the country where successful predictions can be made, and for some places successful predictions are never possible.

This sends us back to the *Farmer's Almanac*, but Mr. Russell does not stand by his preface. He has had long experience in the Signal Service and the Weather Bureau, and his chapter on Weather Predictions shows that he is a master of the subject. Very instructive, also, are the 75 pages devoted to Rivers and Floods and River-Stage Predictions.

His aim is to give almost everything that is considered to be of

interest in relation to the weather; a large programme, which has been fairly filled, though with some extraordinary mistakes as to matters of fact. Mr. Russell puts Reykjavik in *Greenland* (p. 67) and Krakatoa in *Java* (p. 135). He writes Hwangho, the name of the river, for Han-kow, the city on the Yang-tse-Kiang (p. 206). The great drought in the Argentine Republic, in the years 1828–1831, is called, we are told, *Il grand seco* (p. 99); the first word being Italian, the second French, and only the third Spanish. He says on p. 88 that the rainfall at Cherrapunjee, in Assam, amounted in one year to 905 inches. No such fall is recorded. Hunter's *Gazetteer of India* makes the annual average 462.85 inches, and adds:

> It is reported that a total of 805 inches fell in 1861, of which 366 inches are assigned to the single month of July. .

Most surprising of all is the assertion on p. 98, that there are no glaciers in the tropics.

Kilimanjaro is within the tropics, and Dr. Hans Meyer has described its glaciers. Mr. Whymper found glaciers on the Andes of the Equator; on Altar, on Antisana, on Cayambe, on Chimborazo, on Cotopaxi, on Illiniza, on Sara-urcu, and on other mountains, and he says:

> In essential features the Glaciers of Ecuador do not differ from the Glaciers of the Alps, and in minor points they present little novelty.
> (*Travels amongst the Great Andes of the Equator, p. 349.*)

The Bibliography of the Future. A Paper reviewing the existing Condition of National and International Bibliography, with suggested Reforms. By Frank Campbell (of the Library, British Museum). 8vo. London, 1895.

Mr. Campbell's Paper was read before the Annual Meeting of the British Library Association in September, 1894, and it deserves to be read by every one who is interested in the subject of books.

There is no disputing his statement that bibliography is now in a state of chaos and that the first thing to be done is, to devise a system that shall bring order into the work of to-day. This point fixed, it will be possible to attack the accumulated disorder of the past.

The most conspicuous cause of the existing confusion is rightly declared to be the absence of National (compulsory) Registration of Books, the true basis of all bibliography. Everything should be registered. Mr. Campbell gives an illustration of the present method, as follows:

> Six men write six works upon Agricultural Science.

1. One publishes his work separately, and men call it a "book."
2. The second work is buried in a "Collected Works" series, which is generally provided for by one vague title.
3. The third appears through the medium of a learned society journal, and it is called an "article."
4. The fourth appears also as an "article" in a magazine of the day.
5. The fifth appears as a contribution to a National Encyclopædia.
6. The sixth appears by instalments in an enterprising newspaper.

The "book" is catalogued; the others are passed over, and practically disappear.

If there is to be a systematic bibliography, it must follow substantially the lines indicated by Mr. Campbell; but the immensity of the task will discourage the sturdiest reformers.

Survey of Tides and Currents in Canadian Waters. Reports by W. Bell Dawson, C. E. 8vo. Ottawa, 1894 and 1895.

In the first of these reports Mr. Dawson gives the history of the Survey, which practically began in 1890.

The tides on the Canadian Atlantic Coast vary in amount, from four or five feet in the open Atlantic to twelve and eighteen in the St. Lawrence River and thirty feet and more in the Bay of Fundy, and to follow their movements in a satisfactory way it will be necessary to establish a relatively large number of stations. Up to December, 1893, six self-recording tide-gauges had been placed: one each at St. John, N. B., at South-west Point, Anticosti, at St. Paul Island, Cape Breton, at Grindstone, on the east side of the Magdalen Islands,* at Quebec and at Father Point (unfinished). One has since been added, on the west side of Forteau Bay, in the Strait of Belle Isle.

From the observations already made, it appears that the tide at Quebec is nearly simultaneous in absolute time with that at Dover, and the tide at St. John, N. B., with the tide at Brest. At Halifax, although the tide is earlier than at any of the European ports, it is nearly simultaneous with that at Sandy Hook.

At the outset, it was considered most important to ascertain the nature of the currents at the two main entrances to the Gulf of St. Lawrence; the Strait of Belle Isle and Cabot Strait. The results are:

For the Strait of Belle Isle, the currents are fundamentally tidal and, under normal conditions, run east and west with a velocity of about two knots per hour. The inward flow from the east is rather greater than the outward flow from the west.

* So stated in the Report, but the map puts Grindstone on the west.

Mr. Dawson notes that the number of the icebergs which enter the Strait is small in comparison with those which pass its mouth. The depth on a line north from Cape Norman does not exceed 50 fathoms. A berg grounded in 1894 in 59 fathoms, off Chateau Bay, measured, above water, 790 feet in length, 290 in width and 105 feet in height.

The observations in Cabot Strait, continued during the greater part of the month of August, established the following facts: A current runs out of the gulf on the western side and another runs in on the eastern side, while in the middle of the Strait the current is weak and uncertain in direction. On the eastern side the velocity is very little more than one knot per hour; on the western side it amounts to 1.80 knots. The channel from the Atlantic inwards has a width of forty miles and the depth exceeds 200 fathoms, but the currents are not felt below 60 or 80 fathoms.

Mr. Dawson remarks that the influence of the St. Lawrence River upon the currents in the Gulf is usually much exaggerated. It is to be remembered that a current of only half a knot per hour through the Strait of Belle Isle would admit a volume of water 40 times greater than the discharge of the St. Lawrence as measured between Montreal and Lake St. Peter.

Oregon, Its History, Geography and Resources. By John H. Mitchell, U. S. Senator from Oregon. 8vo. Washington, 1895.

Senator Mitchell has a good subject, but he does not turn it to account. The historical portion of his paper is a heated discussion of the Oregon controversy with Great Britain; a matter which has lost its interest.

The geography and natural resources of the State occupy about 12 pages of description, mostly adjectives. There are mountain ranges, clothed with eternal verdure and crowned with eternal snow; there are forests unsurpassed in extent, immense fertile plateaus of everlasting green, grand lakes, which mirror back in sublime beauty their mountain walls of granite, and many other well-known properties.

All these are found within an area of 96,030 square miles:

An area greater in extent by more than 6,000 square miles than all of England, Scotland and Wales combined, with their aggregate population of over 32,000,000; an area over eight times larger than Belgium, with its population of above 6,000,000, and but 6,000 square miles less than one-half that of France, with its 40,000,000 people.

It appears, in fact, that Oregon is larger than any other region that is not as large as Oregon.

Bibliotheca Geographica. Herausgegeben von der Gesellschaft für Erdkunde zu Berlin. Bearbeitet von Otto Baschin, unter Mitwirkung von Dr. Ernst Wagner. Band 1, Jahrgang 1891 und 1892. 8vo. Berlin, W. H. Kühl, 1895.

The Geographical Society of Berlin for many years published, in the last number of its *Zeitschrift* for each year, an accurate catalogue of geographical books, articles, maps and charts. This catalogue was indispensable to all workers in the field of geography. It ceased with the year 1890, and is now replaced by the *Bibliotheca Geographica*, issued as a separate work by the same learned Society.

The first volume, which covers the years 1891 and 1892, contains 506 closely-printed octavo pages and embraces 14,000 titles, which, it may well be said, present the geographical literature of the world for the period. The second volume, devoted to the publications of 1893, will appear before the winter.

Herr Baschin requests the authors of books or articles on geographical subjects to aid him in making the *Bibliotheca* as complete as possible by sending the titles of their contributions to his address:

Otto Baschin,
Berlin W., Schinkelplatz, 6.

Particulars required are: The name of the author, The complete title of the publication, The name, volume-number and page of the magazine, with name of publisher and place, The number of pages, plates and maps (with the scale), The price and the date of publication.

MAP NOTICES.

Atlas of the State of New York, prepared under the direction of Joseph R. Bien. Published by Julius Bien & Co., New York, 1895. Sold by subscription.

This magnificent work, which has been in preparation by Messrs. Bien & Company for the past five years, has appeared and will be welcomed as a very important addition to our knowledge of the State.

The contents comprise a graphic index to the County maps; an excellent map of the United States, reduced from the 9-sheet map of the U. S. Geological Survey; a topographic map of New York State, scale 12 miles to 1 inch; a map of the State, showing location of land grants, patents, and purchases; a series of physical maps, illustrating relief, rainfall and temperature, the density of population, and statistical diagrams, illustrating the population, industries and wealth. These are followed by a series of maps showing counties, upon a scale of 2½ miles to 1 inch. These county maps represent waggon and rail roads, canals, streams, and boundaries of counties, townships, purchases, patents and grants. Relief is expressed by hachures, wherever it is known. It may be added that over most of the area of the State, so little is known of the relief that it cannot be expressed, even in this way. These county maps comprise 26 out of the 36 plates of the Atlas. The cities of New York, Brooklyn, Albany, Syracuse, Rochester and Buffalo, are represented by maps on large scales.

The Atlas contains a full index of place names.

In the preparation of this atlas, full use has been made of the triangulation of the U. S. Coast and Geodetic Survey, the U. S. Lake Survey, the U. S. Geological Survey, and the State (Gardner) Survey, for the correction of positions.

For details of topography, the atlas sheets of the U. S. Geological Survey, covering about ⅛th of the State, have been fully utilized. Elsewhere, local surveys, railroad surveys, and county records have been used, and these have been supplemented by a large amount of original work.

It is but slight commendation to say that this is by far the best atlas of the State ever published, both in respect to accuracy and form.

It is published by lithography, most of the plates being in four colors.

Gewässer und Höhenkarte des Königreichs Württemberg in Maſsstab 1:600,000. Herausgegeben von dem Kgl. Württ. Statistischen Landesamt, 1893.

Relief is effectively expressed by shades of green, buff and brown, at intervals of every hundred metres up to 1,000 metres, thence at 1,500 and 3,000 metres.

ACCESSIONS TO THE LIBRARY.

April-June, 1895.

BY PURCHASE.

History of Richmond County (Staten Island), New York, Edited by Richard M. Bayles, New York, 1887, 4to; The Wild Beasts, Birds and Reptiles of the World, by P. T. Barnum, Chicago and New York, 1888, 4to; The History of the State of Georgia, 1850 to 1881, by I. W. Avery, New York (1881), 8vo; Historical Sketches of Northern New York and the Adirondack Wilderness, by N. B. Sylvester, Troy, 1877, 8vo; An Excursion to the Mammoth Cave and the Barrens of Kentucky, by R. Davidson, Philadelphia, 1840, 12mo; New Indian Sketches, by P. J. De Smet, S. J., New York, n. d., 12mo; History of the Schenectady Patent in the Dutch and English Times, by J. Pearson (*et al.*), Albany, 1883, sq. 8vo; China, a History of the Laws, Manners, and Customs of the People, by John Henry Gray, London, 1878, 3 vols., 8vo; American Medical Botany, by Jacob Bigelow, Boston, 1817–1818, 2 vols., 8vo; History of Mason and Dixon's Line, by John H. B. Latrobe, Philadelphia, 1855, 8vo; The Statesman's Year Book, 1895, by J. Scott Keltie, London, 1895, 8vo; La Colonisation Française en Indo-Chine, par J.-L. de Lanessan, Paris, 1895, 12mo; The River of the West, Life and Adventure in the Rocky Mountains and Oregon, by F. F. Victor, Hartford, 1870, 8vo; Centennial Celebration of the Settlement of Bangor, Sept. 30, 1869, Bangor, 1870, 8vo; Lands of the Messiah, Mahomet and the Pope, by John Aiton, London, 1852, 8vo; Pioneer History of the Champlain Valley, by Winslow C. Watson, Albany, 1863, 8vo; Tenting on the Plains, by Elizabeth B. Custer, New York, 1893, 16mo; Pictures of Travel, Heinrich Heine, Translated by Charles G. Leland, Philadelphia, 1863, 12mo; History of Chautauqua County, N. Y., etc., by A. W. Young, Buffalo, 1875, 8vo; History of the City of Trenton, N. J., by J. O. Raum, Trenton, 1871, 8vo; Proceedings Commemorative of the Settlement of Newark, N. J., on its Two Hundredth Anniversary, May 17th, 1866, Newark, 1866, 8vo; Orient Sunbeams, by S. S. Cox, New York, 1882, 12mo; First, Second and Third Annual Reports, Geological Survey of Texas, by E. T. Dumble, Austin, 1890, '91, and '92, 3 vols., 8vo; Colección

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Bulletin Trimestriel, 4e Année, No. 28, Mai, 1895.

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TRANSACTIONS OF THE SOCIETY.

APRIL–JUNE, 1895.

A Regular Meeting of the Society was held at Chickering Hall, Monday, April 8, 1895, at 8.30 o'clock P.M.

Vice-President Viele in the chair.

On the recommendation of the Council, Civil Engineer R. E. Peary, U. S. N., was unanimously elected an Honorary Member of the Society.

The following persons, recommended by the Council, were elected Fellows of the Society:

Miss Luella A. Owen,	St. Joseph, Missouri.
Thos. Le Boutillier,	
Prof. Courtenay De Kalb,	Rolla, Missouri.

The following resolutions, adopted by the Council at a meeting held on Saturday, April 6, 1895, were read to the Society:

Resolved, That we have learned, with sincere regret, of the death of William Remsen, a member of this Society for forty years, and for many years Chairman of its Council, who, by the interest he manifested throughout that long period in all matters of geographical inquiry and the extension of geographical knowledge; his uniform regularity in attending all meetings of the Society and of its Council; his assiduous attention to the duties of the office of Chairman of the Council; his sagacious advice and the active part he was always willing to take in the management of the Society's affairs; his liberal contribution towards the purchase of the house we now enjoy; and his urbanity, courtesy and kindliness in all his relations with his fellow associates, made himself one of our most valuable members, and one to whom the Society, especially in its earlier struggles, has been largely indebted for its present position and prosperity.

Resolved, That a copy of these resolutions be sent to the family of our deceased associate.

The Chairman then introduced to the Society Mr. Alfred F. Sears, who delivered a lecture on the Coast Desert of Peru, illustrated with stereopticon views.

On motion, the Society adjourned to the 18th of November, 1895.

THE GREENLAND SCIENTIFIC EXPEDITION.

The steamer *Portia*, carrying the members of this Expedition, left the pier at the foot of Joralemon Street, Brooklyn, at 1 o'clock P.M., on the 22d of June, for St. John's, Newfoundland.

The following letter, reprinted from the New York *Tribune*, gives the details of the organization so successfully carried out by Mrs. Peary:

To the Editor of the Tribune :

SIR: The steamship *Portia*, from Brooklyn to-morrow, will carry the members of the Greenland Scientific Expedition of 1895 to St. John's, N. F. Here they will board the steam barkentine *Kite*, Captain John Bartlett master, and will sail for Greenland about July 1. The expedition will be under the direction of my brother, Emil Diebitsch, of Washington, and the party will be composed of Professor Rollin D. Salisbury, of Chicago University; Professor L. L. Dyche, of the Kansas State University; Theodore Le Boutillier, of Philadelphia, and Dr. John E. Walsh, of Washington. The only passenger will be Echi-och-a, better known as Bill, the little Esquimau girl, who during the last winter has resided with me in Washington.

The expedition has two principal objects in view—first, to reach Anniversary Lodge, Bowdoin Bay, in North Greenland (lat. 77 degrees, 48 minutes), in order to communicate with Mr. Peary, his companion, Hugh J. Lee, of Meriden, Conn., and his faithful servant, Mathew Henson, of Philadelphia, and to enable them to return to the United States; second, to afford the scientists who accompany the expedition opportunities to study the geology and glaciers of the country, as well as the flora and fauna of the region to be visited. Special efforts will be made to secure specimens of the animals, more particularly the walrus, bear, seal and reindeer. At present no group of North Atlantic Walrus can be found in any of our museums.

To raise the funds necessary to fit out and equip the expedition has taken my entire time and attention during the last winter, as well as that of my brother, who has been my constant aid and counsellor. The work has been considerably lightened by the deep interest which the American Geographical Society, the American Museum of Natural History, the Philadelphia Geographical Club and Chicago University have taken in Mr. Peary's explorations.

These bodies have aided me in many ways, and their representatives form the personnel of the Greenland Scientific Expedition of 1895. But of all those to whom I am indebted for help in this, my cause, none have earned a greater share of my gratitude than those individuals who, inexhaustible in resources and tireless in energy, have given their time, their money and their influence to the project and have honestly declined to have their names brought forward in connection with its fulfilment. When I ventured into the lecture field for the purpose of augmenting the slowly increasing fund, I was immediately taken under the protecting wings of the Brooklyn Institute of Arts and Sciences and the National Geographic Society of Washington, and I feel that my success on the platform was largely due to their influence and help.

The parties most directly interested in the success of this expedition are too well known to need more than the briefest mention. Mr. Peary, after his successful journey to Independence Bay, on the hitherto unknown coast of Greenland, in the spring of 1892, conceived the idea of mapping the entire northern coast from Victoria Inlet to Cape Bismarck, and, if possible, to determine and delineate the detached land masses which he saw lying to the north of him. With this object in view, he organized the expedition of 1893–94, with the avowed purpose of staying two years in Greenland, should it require that length of time to complete his work. In the spring of 1894 he was driven back from the ice-cap by unusual storms, and, retreating in good order, returned to headquarters, determined to make another attempt in the spring of 1895.

Upon calling for volunteers to remain another winter in Greenland, one man stepped to the front—Hugh J. Lee, of Meriden, Conn.—"bravest of the brave!" Napoleon would have had him in the Old Guard! The bright picture which his vivid imagination had painted of Arctic life and Arctic adventures when far away in the States in the warm lecture-room had been dimmed by fierce storms and bitter cold; the darkness of the long night had created shadows where before was sunshine, and the whole scene had changed from one of imaginary glory to one of stern reality, and yet he was ready to go through it all again.

This young hero is a native of Malden, Mass., and before coming north was superintendent of the Boys' Club, of Meriden, Conn., of which city his father, O. D. Lee, is a resident. He was for several years a pupil, though not a graduate, of the Meriden High School, and has two brothers older, and a brother and sister younger than himself. "Imagine," says Mr. Bridgman, the historian of the Peary Auxiliary Expedition of 1894, "a dark, almost swarthy, black-haired, blue-eyed, 170-pound young man, 5 feet 7 inches high, and you will have in your mind's eye Hugh Lee, of whom it is no rash prediction that the world in general, and Arctic exploration circles in particular, will yet hear a good deal more."

Mathew Henson, Mr. Peary's faithful servant, is a colored man, twenty-six years old. He was with Mr. Peary in Nicaragua, and was also on the Arctic expedition of 1891–92. He is strong, active, intelligent and willing, and has demonstrated his ability to withstand cold and privation as well, if not better, than some of the white members of the expedition.

In order to bring these three brave men home I have chartered the steam barkentine *Kite*, 190 tons net, and have secured Captain John Bartlett as her master. The *Kite* is a stanch, snug little craft, well adapted for ice work. She carried us north in the summer of '91 and brought us back in the fall of '92. Only 117 feet long and 26 feet abeam, sheathed with live heart, her bows solid and strapped with iron, she is compact and strong. The engine is a vertical one, of fifty horse-power, placed well aft, thus insuring a short crank shaft for the propeller. This lessens the liability to breakage, while there is less friction and consequently greater speed than in many vessels of higher power. The *Kite* draws only twelve feet of water, and answers her helm quickly, and steams about seven knots per hour, all of which are desirable properties in a region where unknown reefs thrust themselves upon you, great icebergs loom up suddenly out of the fog, and the magnetic needle pointeth where it listeth.

Of the *Kite's* master all that need be said is that he is a member of the Bartlett family—a name known for generations among the greatest seafaring people in the world—the Newfoundlanders. Captain John Bartlett is a nephew of the Captain Bartlett who rescued the *Polaris* party from their dangerous position on the ice-floe

He is a brother of the gallant but ill-fated Henry Bartlett, who commanded the *Falcon* in her trips to North Greenland, and who, together with that ship and its brave crew, went down in the storms of last October, on the way from Philadelphia to St. John's. Captain Bartlett is a skilful mariner, who has been "to the ice" every year since he was old enough to haul a rope.

The leader of the expedition, my brother, Emil Diebitsch, in addition to the interest which he would naturally take in the success of Mr. Peary's plans, is well adapted for the work in hand. He is a graduate in civil engineering from Lehigh University, and in the pursuit of his profession has gained valuable experience for just such work as this. In 1887–88 he crossed Nicaragua from ocean to ocean on the line of the Nicaragua Canal, living in the jungle for the greater part of the year. From 1891 to 1894 he was stationed at the United States Naval Station, Port Royal, S. C. When the hurricane and tidal wave of August, 1893, swept over the Carolina coast, he was absent from the station, but immediately hastened to the scene of disaster. The last twenty-five miles of the journey were made on foot through a storm-wasted country. By swimming the bridgeless streams, he managed to report for duty the day after the hurricane, being the first person to bring news from the outside world to the storm-wrecked people. For this he received the official thanks of the Navy Department. Mr. Diebitsch is an active, energetic man, of cool judgment and resolute will. He was a member of the Peary Auxiliary Expedition of 1894, and is therefore acquainted with the region which he is to visit. He has some knowledge of astronomy and navigation, and possesses the complete confidence of both Mr. Peary and myself.

Rollin D. Salisbury, professor of geographic geology in the University of Chicago, geologist in charge of the surface geology of New Jersey, has done much work in glacial and geographic geology, both in the United States and in Germany. Before going to the University of Chicago, Professor Salisbury was connected with the State University of Wisconsin, and still earlier with Beloit College, his alma mater. In addition to holding a professorship in the University of Chicago, he is also dean of the University College in that institution. Professor Salisbury has published many papers and reports on geological subjects, which have appeared in the various geological journals of America and in the publications of the National and New Jersey Surveys. Physically he is a man of splendid proportions, strong and vigorous. He is about thirty-five years of age, and will devote his attention principally to the glaciers, though little of geological importance will escape his alert and scientific eye.

Professor Salisbury is a colleague of Professor T. C. Chamberlain, of the University of Chicago, the geologist of the Peary Auxiliary Expedition of 1894, and his work this summer, together with that of Professor Chamberlain of last year, will make a most exhaustive study of Greenland glaciers, which would in itself warrant the sending of an expedition to the north.

Lewis Lindsay Dyche, professor of zoology, taxidermist and curator of mammals and birds, State University, Lawrence, Kan., is a most enthusiastic and successful collector and naturalist. At the World's Fair in Chicago he received the highest prize for the best exhibit of North American mammals. Professor Dyche was a member of Dr. Cook's Arctic excursion on the ill-fated *Miranda*, and, despite the many mishaps which befell the party, he managed to collect about five hundred animals, some of which were new species, and all of which were abandoned with the *Miranda*. Nothing daunted, Professor Dyche left Gloucester, Mass., on May 15 last on a fishing schooner bound for South Greenland, where he is now, collecting specimens. About July 10 the *Kite* will pick him up at Holsteinborg, and carry him north

with the expedition. Here he will have charge of the collections for the American Museum of Natural History.

Theodore Le Boutillier is the representative of the Philadelphia Geographical Club, one of Mr. Peary's stanchest supporters, and a club which, either as an organization or through its individual members, has always contributed generously toward the Peary expeditions. It was under the auspices of the Philadelphia Club that the Peary Auxiliary Expedition of 1894, with Henry G. Bryant in charge, made its successful journey to North Greenland in a season of unusual severity, which proved disastrous to Cook, Wellman and perhaps Jackson. Mr. Le Boutillier is a student of the University of Pennsylvania, originally in the arts department, but now a student of medicine. He is a son of Robert Le Boutillier, of Homer Le Boutillier & Co., of Philadelphia, and has accompanied Professor Heilprin on several expeditions, notably to the Bermuda Islands in 1894. Professor Heilprin describes him as "a most expert collector."

Dr. John E. Walsh, the surgeon of the expedition, is a Washingtonian by birth and education. He is about thirty years old, was for two years lecturer on histology and pathology at the National Medical College, and for some time house surgeon in charge of the Washington Asylum Hospital. When small-pox was raging in Washington last year he was employed as inspector by the Health Office, and did most excellent work, displaying courage, judgment and ability in a very trying position. Dr. Walsh is a member of the American Medical Association of the District of Columbia and various other medical societies. He has contributed numerous articles on medical topics to various medical journals.

Through the thoughtfulness of Messrs. McKay and Dix, ship brokers, I am in receipt of the following encouraging news:

"The steamer *Trox II* arrived at Copenhagen, May 13, from Ivigtut, Greenland, which place she left April 28."

The superintendent of the cryolite mines reports as follows:

"'The winter at Ivigtut has been very mild, so that it was possible to work in the open mines until January 10, when the winter commenced, but without severe frost.'

"We believe this season will form an exceptional one in the Arctic, and it will be possible for a ship to reach Whale Sound without much difficulty. The winter was so mild the ice did not solder, and was constantly moving south, hence its early appearance (February 22) along the southwestern coast of Greenland.

"Our ships have been trading to Ivigtut for the past eighteen years, and the mild winter and early appearance of the ice on the coast is a rare exception."

This would indicate an open season this summer, and it is to be hoped that the *Kite* will have little trouble in crossing Melville Bay. Her itinerary is about as follows:

Leave St. John's about July 1; reach Holsteinborg July 7 or 8, and pick up Professor Dyche; Godhavn about July 12, where a week will be spent among the glaciers. Leaving Godhavn about July 20, she should reach Inglefield Gulf and the Peary headquarters about July 27. Mr. Peary promised to be at the lodge not later than August 15. This interim will give the scientists an opportunity to make their studies and collections, which will be continued even after Mr. Peary's return until the end of August. Leaving Inglefield Gulf at the end of August, the *Kite* will steam slowly homeward, stopping at Cape York to take on the "ironstone," and at one or two of the Danish settlements, and reaching St. John's about October 1, where I shall await the arrival of the wanderers.

JOSEPHINE DIEBITSCH-PEARY.

WASHINGTON, June 21, 1895.

The following telegrams appeared in the *New York Times* of June 29 and the *Tribune* of July 9 :

ST. JOHN'S, N. F., June 27.—The steamer *Portia* arrived to-night, bringing Messrs. Diebitsch, Salisbury, Walsh, and Le Boutillier, composing the Peary relief and Greenland scientific expedition. They expect to sail hence Monday or Tuesday, by steamer *Kite*. Considerable ice is reported north.

ST. JOHN'S, N. F., June 28.—The Peary relief expedition will not be able to sail hence before July 6. The steamer *Kite*, which will take the expedition to Greenland, cannot be made ready for the voyage before that date.

ST. JOHN'S, N. F., July 8.—Work upon the Peary expedition's steamer *Kite* is being continued rapidly. She is expected to sail to-morrow evening for Greenland.

Professor Salisbury, a member of the expedition, has just returned from an exploring trip through the interior of the island. He has acquired a large amount of information concerning the geology of the island, especially of the glacial period here.

SIXTH INTERNATIONAL GEOGRAPHICAL CONGRESS, LONDON, 1895.

GENERAL ARRANGEMENTS FOR THE MEETING.

An Invitation Circular has been forwarded to the members of all the Geographical Societies in the world, and to many other persons likely to be interested in the approaching Congress. Through that circular the objects and general plan of the Congress have been made widely known, and copies may still be had on application to the Secretaries.

The following definite arrangements have now been made:

LANGUAGES.—It has been decided that in the meetings and discussions the English, French, German and Italian languages shall be on an equal footing. The abstract of each paper which is received by the Secretaries in time will be circulated before the meeting in the language in which it is written and in English. At the same time it is right to point out that in all congresses the number of members speaking and understanding only the language of the country has been far in excess of those conversant with several languages.

PLACE OF MEETING.—The meetings of the Congress will be held in the rooms of the Imperial Institute, South Kensington, London, S.W., a position easily reached from the South Kensington and Kensington High Street stations on the Underground Railway, and by omnibus from all parts of London. The privileges of honorary members of the Institute will be enjoyed by all members of the Congress, who will thus have the advantages of the free use of what is practically a high-class club with reading-rooms, smoking-rooms, dining-rooms and gardens.

OPENING MEETING.—The Congress will be opened in the great hall of the Imperial Institute on the evening of Friday, July 26, by H. R. H. The Duke of York, Honorary President of the Congress and of the Royal Geographical Society. Particulars of the meetings for the discussion of important geographical questions will be found in the preliminary programme to be issued before the meeting, and in the daily *Journal*.

HEADQUARTERS OF THE CONGRESS.—Until Thursday, July 25, the headquarters and offices of the Congress will remain in the

house of the Royal Geographical Society, 1 Savile Row, London, W., where all information will be supplied, and tickets will be issued.

On Friday, July 26, the office of the Congress will be transferred to the Imperial Institute. If arrangements for hotels or for lodgings have not been made previously, members are recommended to leave their luggage in the "cloak room" at the railway station and come to the office of the Congress for information. Members of the Congress will enjoy the privileges of Fellows of the Royal Geographical Society from July 22d until August 10th, and the rooms of the Royal Geographical Society will be open as a rendezvous for members throughout the meeting.

HOTELS, ETC.—A list of hotels and boarding-houses, and of conveniently situated furnished lodgings will be placed in the office of the Congress, and assistance will be given to members in obtaining accommodation. If the amount and nature of the accommodation required are announced in advance to the Secretaries, much inconvenience would be saved to visitors.

EXHIBITION.—A Geographical Exhibition is being arranged by the Congress at the Imperial Institute. It will include a collection of historical maps, a representative exhibition of geographical instruments, both historical and of the most recent design, portraits of geographers and views of places, as well as special representative exhibitions prepared by the Geographical Societies of Berlin, Paris and St. Petersburg, and numerous exhibits from other countries, and from private persons.

TICKETS OF MEMBERSHIP.—In order to take advantage of the reduced fares offered by the railway companies (see below), the official Congress ticket must be produced when paying the fare. The subscription entitling a lady or gentleman to become a member of the Congress is £1 sterling, but members may procure additional tickets for ladies at the cost of 10s. each. The holders of these additional ladies' tickets (which are transferable to ladies) are associates entitled to all the privileges of members, except that they do not receive the Congress badge, have no vote in the meetings, and will not receive a copy of the report when published. The tickets of all members and associates who pay in advance will be forwarded to their addresses before the commencement of the Congress.

LETTERS TO MEMBERS.—Members and associates may have their letters addressed to them at "Geographical Congress, Imperial Institute, London, S.W.," where special postal facilities will be

provided, and where members are urged to apply at once on their arrival. All invitations to receptions, etc., will be distributed in this way.

ADDITIONAL PRIVILEGES OF MEMBERS.—Members and associates of the Congress will enjoy the additional privileges of honorary members of the Royal Geographical Society, the Imperial Institute, and the Royal Colonial Institute during the meeting of the Congress. The Zoological Society has generously invited members and associates to visit the Zoological Gardens in Regent's Park, admission to which will be granted on presenting the Congress ticket at the gate. The Royal Botanical Society has also offered the free use of its gardens at the south end of Regent's Park to members and associates of the Congress on showing their tickets.

VOTES FOR THE CONGRESS.—Any member desiring to bring forward a resolution for discussion, and to be submitted by voting for the approval of the Congress, must furnish the same in writing to the Secretaries not later than July 1st. All resolutions received in this way and accepted as suitable for consideration will be printed and distributed to members, and the time for their discussion announced in advance.

BADGE.—A handsome badge has been designed, which will be given to each member of Congress on arrival in London, and will form a permanent souvenir of the London meeting. The badges of delegates of Governments and Societies will be silvered, those of ordinary members in bronze.

HANDBOOK TO LONDON.—Messrs. Thomas Cook & Son, the well-known tourist agents, will present a copy of their "Handbook to London" to every member of the Congress on arrival. This book contains a concise statement of all the principal places and sights of London, and full particulars as to railway stations, cabs, and omnibus routes. It is accompanied by maps, including a special map presented by Mr. Edward Stanford; and some pages of special descriptive matter compiled by the Secretaries of the Congress have been added.

RAILWAY ARRANGEMENTS.—Important concessions have been made by a number of railway companies to members and associates of the Congress. On the railways of Russia, Austria-Hungary, Switzerland and Holland, no reductions will be allowed; but by taking tickets to a station in Germany or France, near the frontier, reductions may be secured by visitors from those countries for the

rest of their journey. In all cases it is necessary to produce the Congress membership ticket before receiving railway tickets at reduced rates. Persons desiring to take advantage of these concessions are therefore required to forward their subscriptions in advance. In the following list the countries most distant from London are mentioned first:

Italy.—Meridionale and Mediterraneo Companies, 30 to 50 per cent. reduction on ordinary fares according to distance traversed.

Germany.—An allowance of 50 per cent. will be made off the price of two single tickets for parties of thirty travelling together on outward journey by ordinary trains. No free luggage. It is suggested that arrangements should be made by the German Geographical Societies for allowing parties to meet and travel together from selected centres in order to take advantage of the reduced fares.

Belgium.—State railways allow 50 per cent. off price of two single tickets for parties of twenty members of any one particular Society travelling together on the outward journey. Valid for 30 days. For fares from Antwerp see English Railways.

Holland.—The Zeeland Steamship Company offers return tickets from Flushing to London at a single fare. Similar privileges are offered from Rotterdam and the Hook of Holland.

France.—The Western, Eastern, Northern, Southern, Paris, Lyons and Mediterranean, and Paris and Orleans lines will issue tickets at 50 per cent. reduction on two single fares. The Western and Northern companies will issue tickets at the reduced rates on the presentation of the Congress ticket. The other French companies require to receive in advance a list of members desiring to take advantage of the facilities they offer signed by the President of the Congress. Members of the Congress who wish to travel on these lines are therefore required to send to the Secretaries at 1 Savile Row, London, W., by July 1st, the name of the station of departure and of arrival on the lines in question, and an indication of the exact route. It is essential that the names of such members should be very distinctly written.

English Railways.—London, Chatham and Dover Company offers return ticket at single fare (plus 2s. 6d. pier dues at Calais) from Calais, available one month, or Flushing, available two months.

South Eastern Railway offers return tickets at single fares, from Calais and Boulogne (plus pier dues).

Great Eastern Railway offers return tickets at single fares, from Hook of Holland, Rotterdam and Antwerp.

London, Brighton and South Coast Railway allows 50 per cent.

off price of two single tickets in conjunction with the Western of France Railway.

Most of the railways will give return tickets for excursions from London at reduced fares, to places beyond a certain distance, during the meeting. Particulars will be published later.

STATION OF ARRIVAL.—Passengers travelling by the Great Eastern Railway arrive at Liverpool Street Station. Those coming by any other route from the Continent have a choice of two stations, one in the City, the other in the West End. The latter should be selected as being nearer the place of meeting. On the London, Chatham and Dover, and on the London, Brighton and South Coast Railways the West-End Station is Victoria, the nearest terminus to the Imperial Institute. On the South-Eastern Railway the West-End Terminus is at Charing Cross. Messrs. Cook's interpreters who meet the Continental trains will, if applied to, assist members of the Congress, whether they are travelling with Cook's tickets or otherwise.

EXCURSIONS IN LONDON.—Arrangements will be made for open coaches to leave the Imperial Institute every afternoon during the meeting of the Congress for drives in London and the neighbourhood. Each drive will last for two or three hours and will terminate at the Imperial Institute, and there will be a conductor on each coach who will explain all objects of interest on the way. It may be necessary to make a small charge to members and associates for the drive. Application for places should be made before 12 o'clock each day, and in case of there being an insufficiency of seats preference will be given to visitors from a distance. Details of the drives and of visits to the docks, to public buildings and places of industrial interest will be published in the full programme which will be given to members on their arrival.

ONE-DAY EXCURSIONS.—After the close of the Congress a series of excursions will be organized, for most of which the numbers will be limited. In some instances, the excursion may not take place, unless a sufficient number of members put down their names in advance. The deliberations of the Congress conclude on Saturday, August 3d, and an opportunity will be given to members to rest on Sunday; and on Monday, the 5th, to see one of the great public holidays when all work ceases, and the places of amusement and public parks are thronged by pleasure-seekers of the working class.

During the week ending August 10th, there will be excursions

to Oxford, Cambridge, Windsor and Southampton (Ordnance Survey Office), leaving London in the morning and returning at night.

LONGER EXCURSIONS.—A two-days' excursion will start to Manchester and Liverpool on Wednesday, August 7th, and will be under the auspices of the Manchester and Liverpool Geographical Societies. The Manchester Geographical Society has intimated an intention of inviting a number of the most eminent geographers to be its guests on the occasion, but the excursion will be open to other members who may be prepared to make their own hotel arrangements in Manchester.

A limited excursion will also start for the English Lakes, under the guidance of Mr. J. E. MARR, F.R.S., a geologist who has made that district his special study. In order to fully appreciate this excursion, members must be prepared for a certain amount of walking. It will conclude on Saturday, August 10.

The Royal Scottish Geographical Society will receive the members of the Congress at Edinburgh, probably after the visit to Manchester, when Professor JAMES GEIKIE will conduct a geological and geographical excursion in the neighbourhood of Edinburgh. This will be followed by a physico-geographical excursion to the Scottish Highlands, of a week's duration, which will be under the guidance of Mr. H. M. CADELL, formerly on the Geological Survey of Scotland. If a sufficient number of members desire it, excursions of a week's duration will be conducted to Wales and to Ireland. It is requested that members wishing to take part in the longer excursions should give notice of their intention to the Secretaries as soon as possible.

BRITISH ASSOCIATION.—The meeting of the British Association for the Advancement of Science takes place this year at Ipswich, from the 11th to the 18th of September. Foreign members of the Congress who intend to remain for this meeting, are requested to send their names as soon as possible to "The Recorder, Section E (Geography), British Association, Burlington House, London, W"

ENTERTAINMENTS.—During the meeting of the Congress there will be many entertainments in the form of receptions, dinners, afternoon and evening parties, for which special invitations will be sent to members and associates of the Congress. In most cases the number to be entertained is limited, and it is desirable that the Secretaries should have as complete a list of members as possible to submit to the hosts. Among the arrangements which

have been made are receptions by the President of the Congress, Mr. C. R. Markham, the Earl of Northbrook, the Baroness Burdett-Coutts, the Right Hon. Sir George Bowen, the Hon. George N. Curzon, the Astronomer Royal at Greenwich Observatory, Mr. Thiselton-Dyer, Director of the Royal Gardens at Kew, and Mr. G. Cawston. One reception at least will be held in the Imperial Institute Others will probably be announced later.

Arrangements will probably be made by which a special room at the Imperial Institute will be reserved each evening for members and associates of the Congress to dine together at a moderate cost.

Full details as to excursions and other arrangements will be obtainable by members on arrival in London.

PROVISIONAL PROGRAMME OF MEETINGS.—On Friday, 26th July, the Congress will be opened in the Great Hall of the Imperial Institute at 9 P.M., when short addresses of welcome will be delivered by H. R. H. The Duke of York, Honorary President, and by Mr. Clements R. Markham, President. A Conversazione in the rooms and gardens of the Imperial Institute will follow.

On Saturday, 27th July, Mr. Markham will deliver his Inaugural Address in the Great Hall at 10 A.M., after which the Congress will meet in two sections to discuss papers on *Geographical Education*, by Professors Levasseur and Lehmann and others, and on *Mathematical Geography*, especially the use of photography in surveying, by Colonel Laussedat, Colonel Tanner and others.

No meetings will be held on Sunday, but many members will doubtless take advantage of the opportunity to visit the Zoological Gardens in the afternoon.

On Monday, 29th July, a general meeting of the Congress will discuss the subject of *Arctic and Antarctic Exploration*, introduced by Professor Neumayer and Admiral A. H. Markham. In the afternoon two sections will be formed, in one of which questions in *Geodesy* will be treated by General Walker and M. Lallemand, while in the other papers will be read by Prince Roland Bonaparte on *Glaciers*, and M. Martel on *Speleology*.

On Tuesday, 30th July, report of committees and papers on the proposed *Map of the World* on the scale of 1:1,000,000, and on *International Geographical Bibliography*, will be presented at the general meeting, and two sections will then deal with *Oceanography*, and with the *Orthography of Place Names*.

On Wednesday, 31st July, Sir John Kirk will initiate a discussion on *Europeans in Africa* in the general meeting, and in the

afternoon the sections will consider *Applied Geography* (Commercial Geography) and *Limnology*, the latter to be introduced by Professor Forel.

On Thursday, 1st August, the general meeting will deal with the *Terminology of Land Forms*, and in the afternoon *Cartography* and other subjects will be treated.

On Friday, 2d August, the forenoon will be devoted to papers by Baron Nordenskiöld, Professor Hermann Wagner, and others, on the *History of Maps*, and all the remaining papers will be taken in the afternoon.

On Saturday, 3d August, the votes proposed for consideration will probably be discussed, the date and place of meeting of the next Congress considered, and the President will deliver his concluding address.

The foregoing is a purely provisional programme in which only a few of the promised papers are mentioned, and while, in its main features, it will probably be adhered to, the details may be changed. A detailed programme will be distributed on the opening day, and full particulars of each day's proceedings, both at the Congress meetings and in excursions and entertainments, will be given in the Congress *Journal*, which will be distributed each morning.

ACTING OFFICERS OF THE CONGRESS.

President.—Clements R. Markham, C.B., F.R.S.

Vice-Presidents.—To be appointed at the meeting.

Chairman of Committees.—Major L. Darwin, R.E., M.P.

Secretaries.—J. Scott Keltie, Hugh Robert Mill.

Secretaries for Exhibition.—John Coles, E. G. Ravenstein, John Thomson.

Secretaries for Receptions.—Sir Clement Hill, K.C.M.G., E. Delmar Morgan.

Assistant Secretaries During Meeting.—J. Theodore Bent, Miss Cust, G. G. Chisholm, B. V. Darbishire, H. N. Dickson, E. Heawood, A. J. Herbertson, H. Yule Oldham, H. S. Schlichter, A. Silva White.

GOVERNMENT DELEGATES.

France.—M. le Colonel Bassot, de l'Institut (War Department); M. Bouquet de la Grye; M. le Prof. Henri Cordier; M. le Prof. Hamy, de l'Institut; M. le Prof. Émile Levasseur, de l'Institut; M. Charles Maunoir; M. Perin; M. Schéfer (Education Department); M. Camille Guy; M. Marcel Dubois (Colonial Department).

Austria.—Herr Vinzenz Haardt von Hartenthurn; Herr Dr. Oskar Lenz; Herr Prof. Dr. A. Penck.

Hungary.—Dr. Albert Erödi; Prof. Ludovic Lóczy; Prof. Dr. Arminius Vámbéry.

Italy.—Colonel Louis Gilletta (War Department).

Sweden and Norway.—Dr. Johan Arvid Kempe; Dr. Otto Pettersson.

Netherlands.—Count O. J. H. van Limburg Stirum.

Belgium.—M. le Comte Goblet d'Alviella; M. de Ceuleneer; M. Jules Leclercq; M. Léon Leclère.

Portugal.—Senhor Conselheiro Francisco J. Ferreira de Amaral; Senhor Luciano Cordeiro; Commander Ernest de Vasconcellos.

Switzerland.—Herr Prof. Dr. E. Brückner; M. le Prof. Raoul Gautier; Herr Nationalsrath Dr. A. Gobat.

Turkey.—Numan Kiamil Bey; Colonel Riza Bey.

United States.—W. W. Rockhill, Esq.

Mexico.—Don Enrique L. Gonzalez; His Excellency Don Cayetano Romero.

Argentine Republic.—Dr. Luis M. Dominguez (Geographical Institute).

Chile.—Dr. Eduard Moore.

Queensland.—Sir James F. Garrick, Q.C., K.C.M.G.

Tasmania.—Sir James A. Youl, K.C.M.G.

South Australia.—Hon. Thomas Playford.

Western Australia.—Sir Malcolm Fraser, K.C.M.G.

Cape of Good Hope.—Abraham de Smidt, Esq.

DELEGATES FROM GEOGRAPHICAL SOCIETIES.

Société de Géographie, Paris (founded 1821).

Delegates—Prince Roland Bonaparte; Comte Henri de Bizemont; M. le Prof. Henri Cordier; M. le Prof. Hamy, de l'Institut; M. le Baron Hulot; M. le Prof. Albert de Lapparent; M. le Prof. Émile Levasseur, de l'Institut; M. Willy Lévy d'Abartiague; M. Charles Maunoir.

Gesellschaft für Erdkunde, Berlin (1828).

Delegate—Herr Prof. Dr. Karl von den Steinen.

Royal Geographical Society, London (1830).

Represented by the Officers of the Congress.

* Norske Geografiska Selskab, Christiania (1839).
Delegate—Dr. Yngvar Nielsen.

Imperial Russian Geographical Society, St. Petersburg (1845).
Delegates—M. le Général Annenkoff; M. le Professeur Anuchin; Dr. A Grigorieff; M. Grum-Grijimailo; M. Radloff; M. Raïevsky; M. Semionoff; M. Shokalsky; M. Struve; M. Chihacheff; M. le Baron Toll; M. le Baron Trobenberg; M. le Baron Wrangel.

American Geographical Society, New York (1852).
Delegates—Hon. Charles P. Daly, LL.D.; Wm. Libbey, Jun., Esq., D.Sc.

K. K. Geographische Gesellschaft, Vienna (1856).
Delegate—Chevalier Ernst von Hesse-Wartegg.

Société de Géographie, Geneva (1858).
Delegate—M. le Prof. Raoul Gautier.

Verein für Erdkunde, Leipzig (1861).
Delegate—Dr. Hans Meyer.

Geographische Gesellschaft, Munich (1869).
Delegates—Prof. Dr. S. Günther; Prof. Dr. E. Oberhummer.

Geographische Gesellschaft, Bremen (1870).
Delegate—Herr Dr. M. Lindemann.

Magyar Földrajzi Társaság, Budapest (1872).
Delegate—Dr. Bela Erödi.

Magyar Tudományos Akadémia.
Delegates—Dr. Arminius Vámbéry; Prof. Ludovic Lóczy.

Sociedade de Geographia de Lisboa (1873).
Delegate—Senhor Luciano Cordeiro.

Geographische Gesellschaft, Bern (1873).
Delegates—Herr Nationalsrath Dr. A. Gobat; Herr Prof. Dr. E. Brückner.

Koninklijk Nederlandsch Aardrijkskundig Genootschap, Amsterdam (1873).
Delegates—Prof. Dr. C. M. Kan; J. Æ. C. A. Timmerman; H. D. J. Maas.

Société de Géographie, Lyons (1873).
Delegate—M. J. Cambefort.

Sächsisch-Thüringischer Verein für Erdkunde, Halle (1873).
Delegate—Herr Prof. Dr. A. Kirchhoff.

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* The position assigned to this Society seems to be due to a printer's error in the *Geographisches Jahrbuch, Bd.* xiv, *S.* 469. The Norse Geographical Society was founded not in 1839, but in 1889.—Ed. Bulletin.

Société de Géographie Commerciale, Paris (1873).
Delegates—M. le Prof. Marcel Dubois; M. C. Gauthiot; M. le Prof. E. Levasseur, de l'Institut; M. Lourdelet; M. Méjemont; M. le Prof. O. Noel; M. Ravencœur; A. Vandendriesche, Esq.; M. H. de Vérigny.

Geographische Gesellschaft, Hamburg (1873).
Delegate—Herr L. Friederichsen.

Societatea Geografica Romana, Bucharest (1875).
Delegate—M. Georges T. Lahovary.

Société Khédiviale de Géographie, Cairo (1875).
Delegate—Dr. Abbate Pasha.

Sociedad Geografica de Madrid (1876).
Delegate—Excmo. Sr. D. Francisco Coello y Quesada.

Société Royale Belge de Géographie, Brussels (1876).
Delegate—M. le Prof. J. Du Fief.

Société de Topographie de France, Paris (1876).
Delegate—M. Ludovic Drapeyron.

Société Royale de Géographie, Antwerp (1876).
Delegates—Lieut.-Gen. Wauwermans; M. Jan Langlois.

Société de Géographie, Marseilles (1876).
Delegates—M. A. Breittmayer; A. Garsin; M. Jacques Léotard; M. A. Janet.

Svenska Sällskapet för Antropologi och Geografi, Stockholm (1877).
Delegates—Herr S. A. Andree; Prof. Dr. August Wijkander.

Centralverein für Handelsgeographie, Berlin (1878).
Delegate—Dr. Carl Dunker.

Société Languedocienne de Géographie, Montpellier (1878).
Delegate—M. Casimir Maistre; M. Fabvre.

Société de Géographie de l'Est, Nancy (1879).
Delegate—M. le Prof. J. Thoulet.

Société Normande de Géographie, Rouen (1879).
Delegates—M. le Dr. Louis Boucher; M. Gabriel Gravier; M. Prosper Guernet; M. Alfred Raver; M. Gaston Routier.

Société de Géographie, Rochefort (1879).
Delegate—M. Daniel Bellet.

Union Géographique du Nord de la France, Douai (1880).
Delegate—M. le Prof. Henri Cons.

Geographical Society of the Pacific, San Francisco (1881).
Delegate—Chevalier Ernst von Hesse-Wartegg.

Société de Géographie de Lille (1882).
Delegates—Eugène Delessert; M. O. Godin; M. François Masural.

Geographische Gesellschaft, Königsberg (1882).
Delegates—Prof. Dr. Prutz; Dr. Lullies; Prof. Dr. Hahn.

Württembergischer Verein für Handelsgeographie, Stuttgart (1882).
Delegate—Freiherr Franz von König-Fachsenfeld.

Geographische Gesellschaft, Greifswald (1882).
Delegate—Prof. Dr. Rudolf Credner.

Société de Géographie, Toulouse (1882).
Delegate—M. le Dr. de Rey Pailhade.

Sociedade de Geographia de Rio de Janeiro (1883).
Delegates—M. le Baron de Rio Branco; Baron de Sant' Anna Nery; Dr. Robert H. Gunning.

Royal Geographical Society of Australasia, Sydney Branch (1883).
Delegates—The Earl of Jersey; E. Delmar Morgan, Esq.

Royal Scottish Geographical Society, Edinburgh (1884).
Delegates—Professor James Geikie, LL.D., F.R.S.; Lieut.-Col. Fred. Bailey.

Manchester Geographical Society (1884).
Delegate—Rev. S. A. Steinthal.

Mittelschweizerische Geographisch-kommerzielle Gesellschaft, Aarau (1884).
Delegate—Herr Karl Buhrer.

Royal Geographical Society of Australasia, Brisbane Branch (1885).
Delegate—Dr. Hugh Robert Mill.

Tyneside Geographical Society, Newcastle (1887).
Delegate—G. E. T. Smithson, Esq.

National Geographic Society, Washington (1888).
Delegates—Cyrus C. Adams, Esq.; Hon. W. T. Harris; Hon. Gardiner G. Hubbard; Crosby Noyes, Esq.; Miss Eliza R. Scidmore.

Geographical Club of Philadelphia (1892).
Delegates—Henry G. Bryant, Esq.; Charles H. Hutchinson, Esq.

Liverpool Geographical Society, Liverpool (1893).
Delegate—Staff-Commander Dubois Phillips, R.N.

Geographical Association for Improving the Teaching of Geography in Schools, London (1893).
Delegate—B. Bentham Dickinson, Esq., M.A.

The following have been intimated too late for classification:

Sociedad Mexicana de Geografia y Estadistica, Mexico.
Delegate—Don Cayetano Romero.

Verein für Geographie und Statistik, Frankfurt a. M.
Delegate—Herr Rudolf Stern.

Asiatic Society of Japan, Tokio.
Delegate—F. V. Dickins, Esq.

Böhmische Gesellschaft für Erdkunde, Prag.
Delegates—Prof. Dr. J. Palácky; Prof. Dr. F. Metelka.

Brooklyn Institute of Arts and Sciences, Brooklyn.
Delegate—Cyrus C. Adams, Esq.

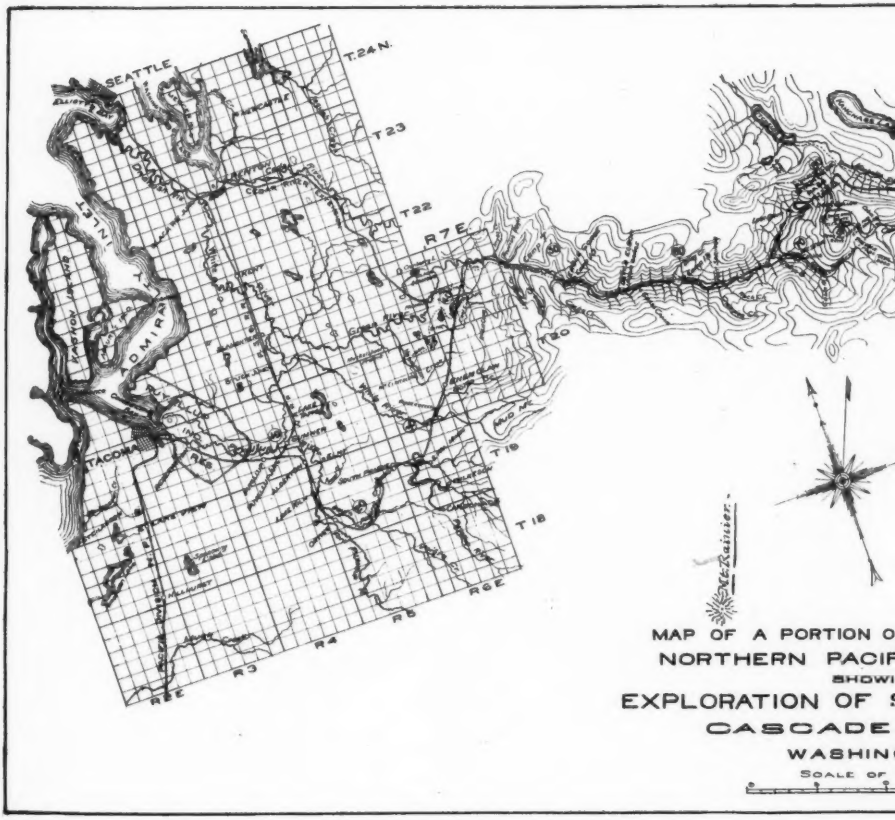
Société d'Archéologie de Bruxelles, Brussels.
Delegate—M. Louis Paris.

Ostschweizerische Geographisch-Commercielle Gesellschaft, St. Gallen.
Delegate—Herr Prof. Amrein.

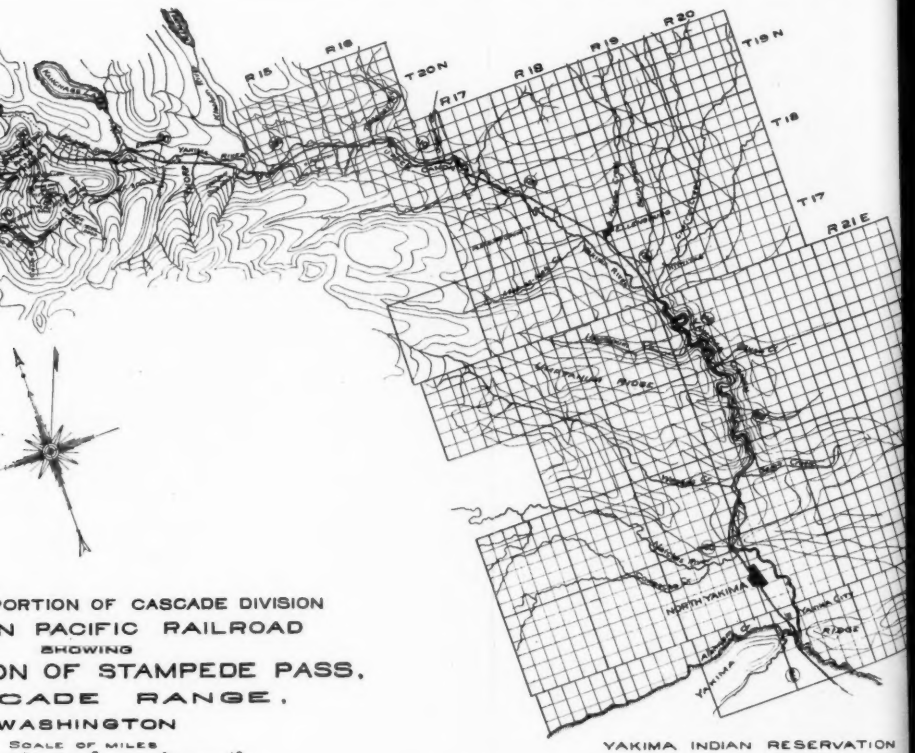
Société des Études Coloniales et Maritimes, Paris.
Delegates—M. Bouquet de la Grye; M. Victor de Ternant.

Sociedad Geografica de Lima.
Delegate—Sr. D. Federico Alfonzo Pezet.

Società Africana d'Italia, Naples.
Delegate—Signor Capitano Matteo Grixoni.



MAP OF A PORTION O
NORTHERN PACIF
SHOWI
EXPLORATION OF S
CASCADE
WASHIN
SCALE OF



ORTION OF CASCADE DIVISION
N PACIFIC RAILROAD
SHOWING
ON OF STAMPEDE PASS,
CADE RANGE.
WASHINGTON
SCALE OF MILES